OCTOBER 1974

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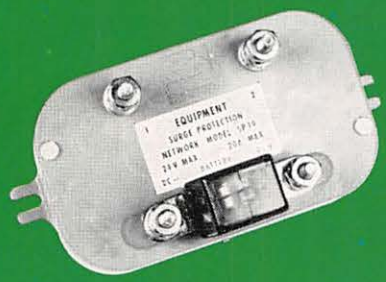

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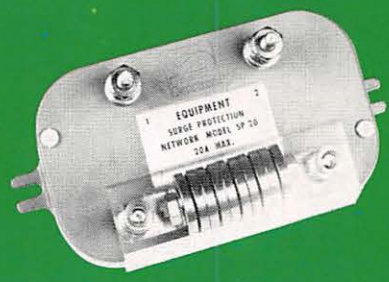

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and
SP20-3

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(Formerly Railway Signaling & Communications)

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RSC News

BART opens final link

On Sept. 16, San Francisco's Bay Area Rapid Transit opened service on the final link of its 71-mile rail network. Various backup monitors and system improvements have corrected the failures which have haunted the system ever since it opened in 1972. The series of malfunctions-including false signals, unscheduled door openings,, and the derailment of one train–forced BART to temporarily abandon its $35 million hands-off controls, and instead rely on flagmen. As a result, state regulators would not permit BART to run its trains through the system's vital 3.6-mile Trans-bay tube connecting suburban lines to downtown San Francisco until the automatic control system worked.

Supervisors of the BART system can track the progress of the 80-mile-an-hour automated trains on the rail network by monitoring a lighted display board in the system's central control room. Computers linked to the display board adjust train schedules and supervise overall system operations. BART's communications and automatic train control system was supplied by Westinghouse Electric Corp.

Soo Line starts installation of new computer system

The Soo Line has begun installation of a new computer system that is part of a $25,000,000 program being carried out this year to improve service to shippers.

The new data processing equipment will be used to expedite movement of freight cars and to improve accounting procedures.

Being installed in the Minneapolis offices are two new IBM 370 model computers and associated hardware. They replace two present IBM 360 series computers that have been in use since 1968. The new machines will be fully operational by December 1.

The new system will be used extensively to maintain up-to-date information on freight car use. It will enable transportation people to exercise more positive control over the movement of loaded cars and provide better, more automated distribution of empty cars moving to meet shipper requirements.

Soo's accounting department has already embarked on new programs to utilize the expanded information storage and retrieval capabilities of the machines. Plans call for continued centralization of billing functions once accomplished at local stations and utilization of new programs tied to credit accounting, handling of rating and division matters, and to determine interline settlements. The system is already being used to provide faster application of cash to customer accounts and give faster access to customer records stored in the computer.

The new $2 million system is being tied directly into a data network that includes outlying terminals over most of the railroad's 4,700 mile system. It is one phase of an improvement program for 1974 that includes the purchase of 12 new locomotives and 309 freight cars and a major roadbed improvement program that is the largest in the Company's post-merger history. The new computer equipment is Soo's fourth generation of computers that have been in use since the first one was installed in 1957.

MOPAC awards $4.6 million contract to Incoterm Corp.

Incoterm Corp. has announced the receipt of a contract from the Missouri Pacific, the Texas & Pacific and the Chicago & Eastern Illinois valued at about $4.6 million in intelligent computer terminal systems and equipment and services. The contract calls predominantly for the installation and maintenance of Incoterm's SPD 20/20 series of terminal equipment. In addition, Incoterm's SPD 10/25 series and a variety of peripherals including high speed printers, card readers, and printer/reader punches have been ordered.

Equipment will be installed throughout the railroad system in a real time on-line inquiry/response environment for use in freight car control, waybill preparation, report generation, and transmission of freight yard operating information. Installations of the Incoterm equipment are scheduled to run through the first quarter of 1976.

NYCTA to install $14 million of signaling equipment

WABCO recently announced the receipt of an order from the New York City Transit Authority amounting to more than $14 million for the manufacture and installation of block signaling and interlocking equipment on the Jerome Avenue Line between 138th street–Grand Concourse and 167th

Approach and Island Frequency Shift Overlay Track Circuits

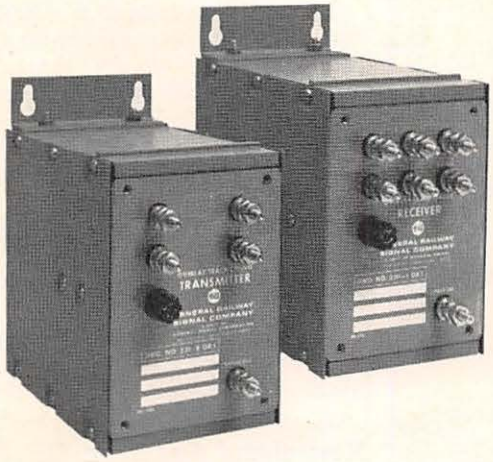
FOR HIGHWAY CROSSING PROTECTION

GRS approach and island frequency shift overlay (FSO) track circuits have unprecedented immunity to noise and interference – also, insulated joints are not required. Approach FSO track circuits, up to 6000 feet long, are available in 15 mutually compatible channels ranging from 618 Hz to 11.43 KHz. Island FSO track circuits, from 60 to 300 feet long, are available in 3 mutually compatible channels ranging from 13.8 to 20.9 KHz.

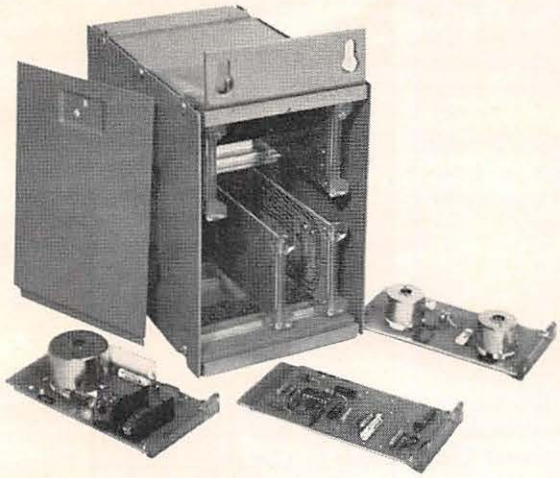
Major features and options for approach and island FSO include:

- Selection of transmitter output power – 600, 400, or 200 milliwatts.
- Plug-in power unit – increases approach FSO transmitter output to 4 watts.
- Five-way mounting – shelf-mounted, wall-mounted any of three ways, or rack-mounted in a Type B2 relay space.
- Centralized equipment location – approach FSO transmitter and receiver can both be mounted in the same wayside case and use the same power supply.

Also available is a new GRS insulated joint bypass unit which effectively passes all approach frequencies and causes only a minimum reduction in track circuit length.



Conveniently located AAR terminal posts provide for track, power, relay and ground connections.



Frequency determining elements are on three printed circuit boards – simply replace these boards to change a frequency channel.

GENERAL RAILWAY SIGNAL
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ROCHESTER NEW YORK 14602

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RSC News

(continued from page 4)

street stations of Division A in the Bronx.

The equipment being furnished includes a new 25 foot master signal tower push-button route type interlocking panel at 149th street, to control train movements, and a data transmission system to send track occupancy information to a new mimic panel in the NYCTA train command center at Jay street in Brooklyn. The operation of indication lights on this mimic panel is an important step to automatically provide continuous actual train location information for the entire NYCTA main-line rail transit system in their Brooklyn headquarters.

Other equipment to be provided includes new signals, switch mechanisms, train detection circuits, and control logic for this continuing modernization program being implemented by the NYCTA to improve service and reliability on its lines.

Globe-Union and North Electric Co. reach agreement for battery systems

Globe Battery Division of Globe-Union, Inc. has announced an agreement with North Electric Co., Supply Division, Lenexa, Kan. for national distribution of Tel/Cell stationary battery systems. These systems are designed to provide standby power for EPABX communications equipment manufactured by Control Networks Corp., and widely used in independent telephone systems.

North Electric is a major distributor of electronic equipment to the communications industry.

In making the announcement, Globe points out that this is the first such agreement involving distribution of their TC 72 100E communications battery systems. The systems were developed jointly by Globe and Control Networks Corp. for use with the CNC EPABX systems. The battery system provides eight hours of standby power and consists of 12 6-volt batteries, a two-tier rack, cables and a maintenance kit.

JNR to start computer-based information system

A container information service has been developed by Japanese National Railways to provide shippers with up-to-the-minute information on the location of container freight shipments.

Known as EPOCS, the service is based on a Sperry Univac 494 computer system connected to terminals at 140 stations and 230 transportation offices throughout Japan. High-speed communication links operating at speeds of 2400-baud are used for the network.

JNR plans to start actual operation of the new service in April 1975. In addition to the freight status information, the new service will enable freight transport reservations to be made almost instantaneously upon application by consignors. Transport companies can use the service to obtain such information as the number of containers being used and their destination.

JNR expects to realize a considerable speed-up and power savings in transport operations as well as far more effective utilization of containers.

Amtrak to handle Southern's reservations

Amtrak and the Southern have signed an agreement under which Amtrak's nationwide toll-free computerized reservation and information system (ARTS) will handle Southern's reservations and information.

Under terms of the agreement, information about all Southern train services will be included along with Amtrak services in ARTS computers, and ticketing for Southern's trains and Amtrak trains and connections between the two will be possible by 24-hour, toll-free telephone. Southern will reimburse Amtrak for the cost of the computer services plus all supplied equipment installed on Southern.

The ARTS (Automatic Reservation and Ticketing System) was installed initially by Amtrak in the Northeast Corridor in April 1973. It was then expanded incrementally until it now provides 24-hour, daily toll-free public telephone access for all Amtrak intercity rail passenger services.

The system is now handling about 75,000 telephone calls a day.

A single computer in Washington, D.C., serves five regional reservations and information centers. Additional computer access terminals are located in ticket offices throughout the country.

WABCO supplies TRC for Norfolk & Western

Union Switch & Signal Division of WABCO has received an order from the Norfolk & Western for Total Radio Control equipment, that will provide direct voice radio communications between the dispatcher in Roanoke, Va., and all train crews operating between there and Winston-Salem, N.C., a distance of 121 miles.

The TRC equipment is designed to make use of existing conventional land communications circuits through the territory to permit the dispatcher to select a specific field radio transmitter-receiver station to broadcast directly to a train in that area. The equipment uses AT&T's Touch-Tone System to select field stations. The system also permits train crews to place calls directly to the dispatcher through the nearest field transmitter-receiver.

The dispatcher operated equipment will be installed in an existing WABCO Traffic Control Center in Roanoke.

New signal lights on UP

As a result of a five year intensified research and development program, the Union Pacific has started to install, at selected grade crossings in 10 western states, a new high intensity light which hopefully will cut grade crossing accidents. According to E. A. Krause, general signal engineer, UP, the new lights use sealed beam strobe units mounted in standard sized grade crossing signal backgrounds as a supplementary attention getter. The strobe units produce a much brighter light and flash more frequently than standard crossing signal lights.

Servo grants ACI license

Servo Corp. of America, producer of KarTrak Automatic Car Identification Systems, has granted a retroactive license to Computer Identics Corp. and its subsidiary, ACI Systems Corp., both of which are subsidiaries of Pullman Inc. The licensees will make royalty payments to Servo for "past and future manufacture, use, lease or sale of automatic car identification equipment covered by more than 70 U.S. and international patents and applications held by Servo," according to the Servo announcement.

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RAILWAY SYSTEM CONTROLS

RR technology is more important

Monday, Sept. 16

From the first day of the meeting of the Communication and Signal Section, Association of American Railroads, until the last day of the meeting of the AAR's Data Systems Division on Friday, Sept. 20, at the Hyatt Regency Hotel in Atlanta, Ga., it became obvious that the railroad industry is mastering the technology needed to cope with the increased demands being made. In this time of fuel shortages, inflation, ecological and other problems, W. Graham Claytor, president, Southern, told us where it's really at when he opened his speech on Monday morning by saying, "What you do is vital to what all the rest of us do—more so now than ever in the past." Claytor went on to say, "Since the days when the locomotive replaced the horse as motive power, railroads have required effective communication and precise control of train movements. Today this is true more than ever before. The means have certainly grown more complex, but the end remains the same: Close and informed cooperation among people who work together in a business that requires precise timing.

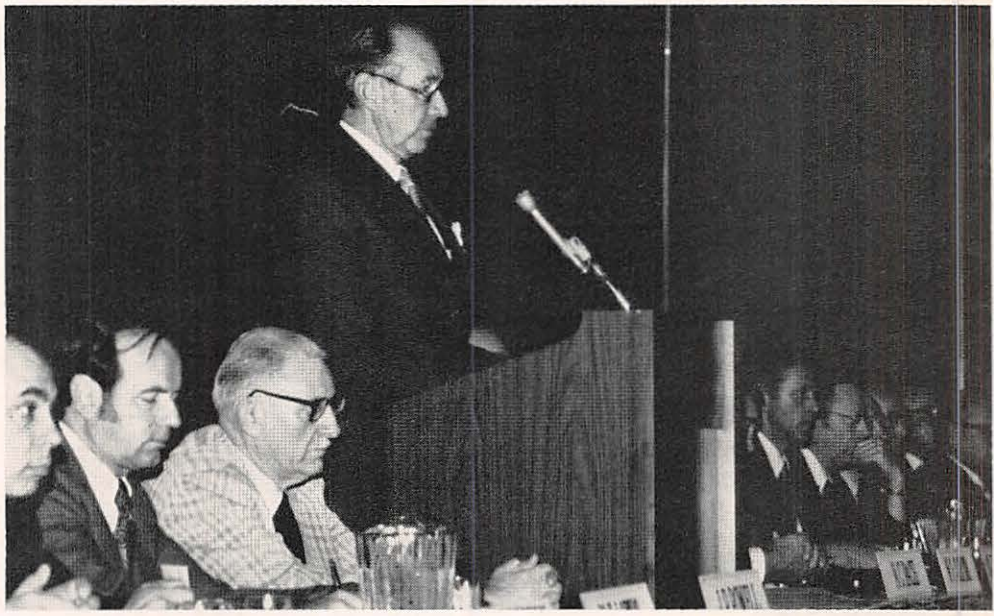
"You keep the railroads' nerve system functioning. And you do it in ways that would amaze your counterparts a generation ago.

"In the working lifetimes of most of us here, the technology of signaling and communications has taken dramatic steps forward.

Over 340 railroad men attended this year's C&S and DSD meetings. Counting wives, suppliers and visitors, the week long meetings saw attendance total almost 1,300 persons.

"Microwave telephone circuits and fixed and mobile radio sets link thousands of miles of rail line into one smooth-functioning system. Centralized traffic control puts hundreds of miles of railroad at one man's fingertips."

Stating that America's railroads continue to make increasing use of these modern methods of signaling and communication, Claytor discussed the following examples, among others, developed by the Southern:



W. G. Claytor Jr., president, Southern, makes opening keynote address at the AAR's recent Communication & Signal Section meeting in Atlanta, Ga.

—"We're expanding our microwave network to include the line from Chattanooga to Memphis, and with it our new classification yard at Sheffield."

—"Among the most useful technological advances of the past two decades have been our sophisticated systems of hot box detection."

—"We no longer think of ourselves solely in terms of operating trains or classification yards, running shops and maintaining our right-of-way, along with the associated signal and communications systems. We realize that railroads are in the business of providing point-to-point transportation of freight for our customers. How well and how consistently we do this are the keys to our success in the transportation business."

Claytor went on to discuss the Southern's cooperation with the Massachusetts Institute of Technology to search for ways of achieving greater reliability. After studying the Southern's operation, the MIT researchers developed some strategies that railroads could use to improve reliability. Southern began implementing some changes suggested by the researchers in May of 1973 and their effect was carefully studied over a period of months. Signaling and communications played an important part in making these changes work and in assembling the data for reviewing the results. According to Claytor, "In most cases they did improve reliability to a clearly measurable degree. Happily, they also resulted in cost savings that, in some cases, were slightly greater than had been expected."

Interconnect

L. Feldner, Chief, Interconnect Branch, Common Carrier Division of the Federal Communications Commission, talked about some of the new regulations which the FCC has developed in the past year and how they will affect the railroads. Feldner emphasized that wire and radio communications must be available for all people. Regulations are to protect the public interest and national defense. "Today's technical explosion and the growing user demand are resulting in a growing number of suppliers. New regulations are needed to organize these new demands.

now than ever

Users are demanding better organization which will require more regulation," Feldner said.

Feldner cited a report of the National Association of Regulatory Utility Commissioners as not reaching a conclusion as to what effect interconnect has had but he did say that Bell telephone claims technical harm is significant. To solve this problem, Bell is requiring all its users to either use their interface equipment or have certain equipment certification made.

Labor-management must communicate

"Labor and management are striving together to provide not only better service, but also better safety," said C. J. Chamberlain, president, Brotherhood of Railroad Signalmen.

Chamberlain cited the current example of management-labor cooperation for improving grade-crossing safety. He emphasized the importance of the ongoing grade-crossing improvement programs which are being implemented all over the country. New technical standards and rules for crossing protection were felt to be very important.

Turning to labor-management relations, Chamberlain said: "We need improvements in relations and communications between signal and communication management and labor." He also urged management to bring problems and suggestions to their local labor chairman.

RR industry must maintain high standards

"Today we face many industry problems both as railroaders and suppliers. There are material and energy shortages. There are governmental demands for more and more action and at the same time imposing many restrictions on your operations," said J. W. Hansen, Chairman and President, Railway Systems Suppliers, Inc. "You represent an elite corps," Hansen said, "one that has proven itself under fire. With everyone from Ralph Nader to government bodies demanding more safety, you have been leading the way for many years to provide the safest form of transportation available and it was accomplished through the application of sound engineering principles which you still uphold today.

"However, I want to caution you against inroads by those who would sacrifice these principles in a misguided effort to apply other industry standards to this business of railroad operating safety. There are efforts being made by government agencies, by so called "experts" in other transportation modes and by a few compromising individuals to reduce the safety effectiveness of the equipment and systems for which you are responsible. Don't let them compromise the fine safety record you have established," Hansen said.

Government role

"We should explore the government role in the railroad industry," said W. E. Loftus, Acting Associate Administrator Office of Policy and Plans, Federal Railroad Administration. Loftus talked about the transportation improvement act and other related works by government which have helped to improve overall safety and efficiency on America's railroads. "We have the best overall failsafe rail-highway crossing system in the world," Loftus said. He also went on to say that the government will be undertaking a major electrification study to find the best technological approach for implementing railroad electrification programs.

More about interconnection

The Special Committee on Interconnection, C&S Section, AAR, made their report available in the 1974 C&S Advance Reports. A summary of the committee report follows.

The past year has been one of intense activity on the part of the FCC, AT&T, Specialized Common Carriers and State Public Service Commissions in all areas of interconnection. The impact of competition on the telephone industry and user, while marked with filings and counterfilings by the various parties, has not resulted in any conclusive action.

The AAR filed comments in connec-

C. J. Chamberlain, president, BofRS

WABCO's J. W. Hansen, chairman and President, RSSI.

W. E. Loftus, acting associate administrator, FRA.

Harmon Electronics

Western-Cullen Division

General Railway Signal Co.

tion with FCC Docket 19528 in Jan. 1974. This proceeding, before the Joint Board of the FCC and the State Regulatory Authorities which are considering the reports of the various technical advisory committees on interconnection, has not resulted in any decision in this regard.

FCC Docket 19691 is requiring the application of protective devices on private line circuits, about which hearings were originally scheduled to begin in May 1974 and have now been postponed until Nov. 12.

The National Association of Regulatory Utility Commissioners instituted an investigation into the economics and quality of service impact on telephone service subscribers resulting from the interconnection of subscriber provided equipment to the public switched telephone network. The AAR submitted comments in this proceeding. As a result of this study, NARUC has proposed a change in the Communications Act which is ostensibly designed to protect the residential user against high cost due to the diversion of revenues from the telephone company to the interconnect industry. This report has generated the introduction of Senate Bill 3580. A House Bill 14848 has been submitted to the House Commerce Committee. This bill would allow users freedom to interconnect. This activity in the Congress is being watched with interest by the committee.

The coming year should result in many decisions which are of importance to the railroad industry. The committee will continue to follow-up and take action as required to insure that the railroad industry position is protected.

Radio liaison report

The Special Committee on Radio Liaison, C&S Section, AAR, made their report available in this year's Advance Report. Some of the high points of their report follow.

On June 27, 1972, the AAR filed a request with the FCC to permit the attachment of a tag on run-through equipment to indicate, "This unit is licensed by more than one railroad." The FCC on July 5 issued a report exempting the railroads from attaching transmitter identification cards to mobile transmitters when engaged in "run through" operations.

Regarding the FCC Docket 19869, Part 94, of FCC rules covering requirements for microwave installations, the AAR has recently released a copy of the filing made in this docket. The information on this filing was worked up with the cooperation of all present users of microwave equipment on the railroads, and the radio liaison committee feels that the filing expresses their opinion as an industry. Further action on the docket will be on the basis of the FCC either issuing a final ruling or calling for oral hearing.

The Radio Liaison Committee was asked to develop a cost per voice channel mile per month for channels derived on microwave systems of member railroads which could be supplied to the AAR for their use with TRAIN II. The cost per voice channel mile developed by the study was 42¢ per mile per month. The channel equipment cost is $8.75 per month for each end of the circuit. Arrangements were made for the AAR to file a request with the FCC to permit the railroads to provide voice channels to the AAR on a shared non-profit basis and permit the industry to use the formula set out to develop these costs and to use the average cost figure per mile per month for this purpose.

Computer based CTC

"The railroad industry's strong growth rate in traffic has been accompanied, unfortunately, by a more than commensurate increase in operating problems," said A. C. Tauch, sales manager, railway systems, TRW Controls. In describing TRW's approach, Tauch pointed out some of the advantages of computerized train dispatching as follows:

"Operating problems and their complexities are not necessarily results of increased traffic, but rather are compounded in nature as operating facility utilization is pushed to near capacity.

"The dispatch function of reading, scheduling and record keeping becomes increasingly more complex. Maintaining schedules with heavy traffic increases the need for coordinating a dispatch function from origin to destination and not just within a dispatch territory. Computer based CTC will have the same significant impact within today's dispatching environment as a conventional CTC control machine had when they were introduced.

"The application proposed by TRW incorporates a system in related tech-

Servo Corp. of America

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nology that is currently available and is being manufactured and implemented for a broad range of applications including CTC.

"Computer based CTC provides the same functions as the conventional control machines in the areas of automatic acquisition of fuel operating data, display indication of fuel operating data, and the subsequent remote control of track side facilities. In addition, computers with the inherent capability to store information, that is the data base, and with the flexibility to accept program instructions enhance the dispatch functions in the following areas: report generation (permanent records are automatically typed or logged to document all operating occurrences), track model display (CRTs provide comprehensive track model displays and dispatcher requests provide an almost instantaneous display of various levels of track models and information), dispatch logic (the dispatcher may assign each train one of three priority levels. Based on these priorities, the system will automatically handle, in sequence, all track and siting alignments to complete all meets. This feature can be overriden by the dispatcher), logic capability (the inherent capability of a computer-based system to program logic), real-time reports."

Network control and monitoring

"The subject of network control and monitoring of a large scale data communications network has not received very much attention," said R. C. Karvwatt, director-communications services, Penn Central. "Effective methods and procedures for the control of teletypewriter networks have been in use for many years. Systems and equipment for analysis of telephone networks have been developed to a high degree of sophistication. Medium and high speed data networks have multiplied at an almost unbelievable rate during the past few years. This is particularly true of on-line dedicated systems. The projections for future expansion of this trend show a growth factor many times that of the previous five years. The objective of an effective network control and monitoring system is to improve the overall reliability of the network."

Karvwatt went on to explain what Penn Central has done to maintain the operation of data communication networks at a high level of reliability consistent with economic return.

Value of data systems

"Although the role of the computer in the railroad industry is significant, it is still in its infancy," said L. S. Crane, executive vice president, Southern. "Today the computer is largely used as a tool to gather data, sort it into reports, and depict what has happened on a historical basis.

"Only limited use has been made of the computer's capability to control the operation. There is a substantial potential for the computer to make additional contributions in the areas of forecasting demand, car distribution and train operations, modeling, waybill preparation, and car information systems.

"There is much work being done in many of these fields by individual railroads and the AAR. Some of these areas are being explored for the first time while others are being redesigned and improved. In our industry there is an ever present challenge to move forward with the development of new concepts and the exploration of new areas."

Crane went on to describe some of the ways Southern has been able to use computers as a tool rather than a data storage device. He cited Southern's Sheffield yard as an excellent example of how the computer and associated data system is utilized and substituted for manual methods in the operation of a railroad. Crane recognizes the need for development of a similar system for flat yards if these are to be integrated into the overall system. He told of a pilot project being undertaken at one of Southern's flat yards that is designed to provide inventory control and terminal information similar to the information that is available at Sheffield.

Speaking about some of the problems railroads are facing today, Crane suggested a few solutions that may be possible by using better data systems. "On a National scale, one of the major railroad problems is that of car utilization. Several events in recent years have served to heighten the interest and concern about car supply. The huge grain shipments to Russia placed a heavy burden on grain-hauling roads. The energy crisis has brought about an increase in the amount of coal that is being moved. As a result, hopper car supplies have become very short.

"These shortages have generated

Henkels & McCoy, Inc.

Solar Power Corp.

AMP Special Industries

Incoterm Corp.

Stromberg-Carlson Corp.

AT&T Co.

much concern on the part of the railroads, the government and the shipper. Part of the solution rests in better utilization of the present equipment. Simply improving car utilization on individual roads cannot completely solve the problem. An effort on the national scale is going to have to be made. This will involve large volume of data that must be digested to keep track of cars as they move from road to road. Systems such as TRAIN I and TRAIN II are addressing these problems," Crane said.

The federal role

"Over the past decade the railroad industry has invested an estimated $150-200 million in developing and installing computer-based data systems to support more efficient control of the car fleet," said J. B. West, transportation specialist, FRA. "This is an impressive achievement, not only in dollar terms, but in the capability of the resulting systems. I have been told and I'm willing to believe, that railroads are among the most sophisticated large industrial users of computer technology.

"As a result of Senate hearings in 1970 which involved itself with the perennial freight car shortage, it appeared that some kind of railroad legislation was almost certain to become law, and Senate concern for car shortages guaranteed that any successful legislation would have to deal with freight cars in a major way.

"On the Senate side, the major development during this period was the so-called "Fastcor" bill. Fastcor would create a self-supporting, government controlled corporation to acquire and operate general service freight cars. Self-supporting I might add at the railroads' expense. Fastcor enjoyed and continues to enjoy considerable support within the Congress. In one form or another it has passed the Senate, not once, but on three separate occasions, each time by an overwhelming majority. Only the House has prevented it from being sent to the White House.

"FRA was, and is, strongly opposed to the Fastcor approach. Simply adding cars to the fleet in the manner of Fastcor, solves nothing. The comprehensive legislative program that FRA sent to Congress in Jan. 1972, covered many problems, from greater rate-making flexibility to discriminatory taxation to railroad loan guarantees. A significant element of that program was a request for $35 million to support research into and development of a "national rolling stock scheduling and control system."

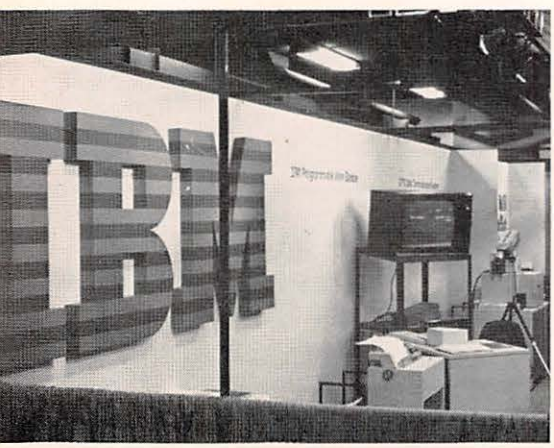
"Unfortunately the political arena into which this legislation was introduced has led to significant misunderstandings about what is intended. Legislation is handled by policy makers, not technicians. They deal in concepts not details," West said.

Despite the failure of FRA's earlier legislative initiatives, West said that the FRA has obtained significant authority for car management research. For fiscal year 1975, FRA has over $4 million available for car management research.

"FRA defines freight car management broadly. Our desire is to develop, in cooperation with the railroads, a balanced program that encompasses not only advanced on-line real-time systems but other approaches as well. The application of off-line data processing capabilities to solving transportation problems, for example, is no less important. Computers can provide transportation planners not only with data but also with powerful analytical tools.

"Moreover, FRA defines 'national' freight car management as encompassing all facets of the operating problem right down to the individual terminals and yards. It does little good to improve the national or inter-line flow of cars unless individual railroads and yards have the ability to do their part equally efficiently. Similarly, freight car management inevitably must encompass the locomotives, trains, crews, and other operating factors that are necessary to move cars. We call it freight car management because the car is the basic factor of production. It could easily be called operations management.

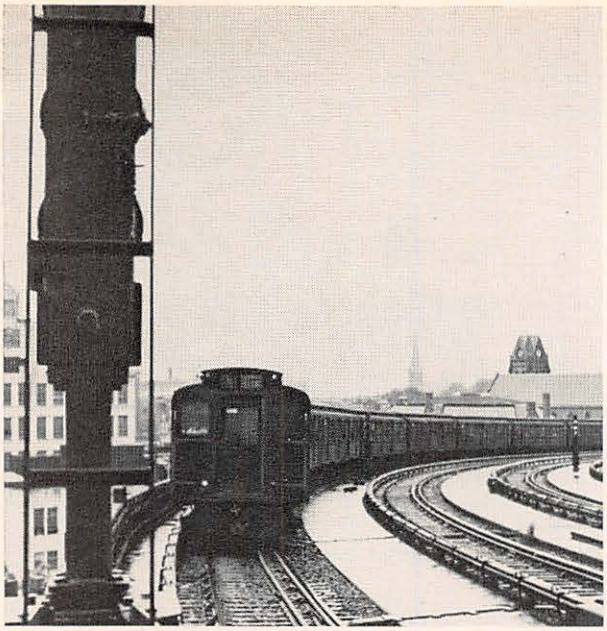
"FRA's role is strictly a research and development role. Ultimate implementation and operation must remain a responsibility of private industry. FRA is in no way seeking operational control or even unlimited access to operating data," West said.

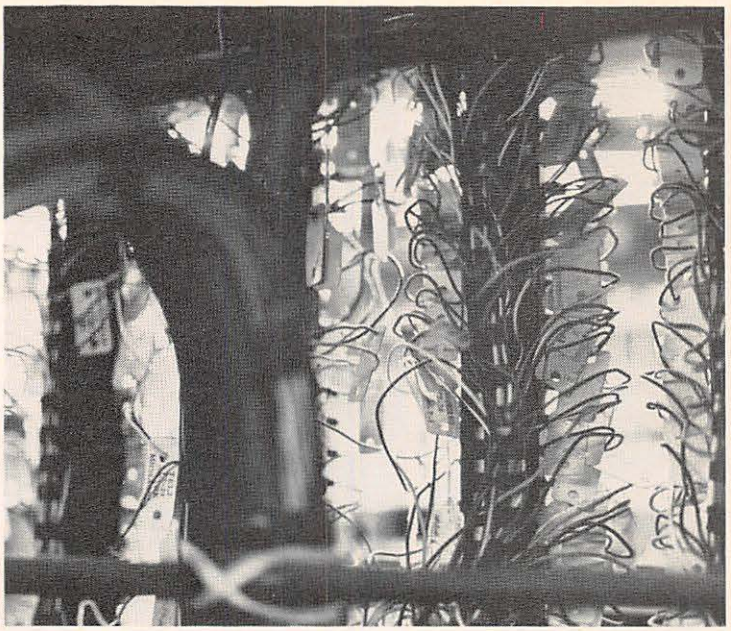


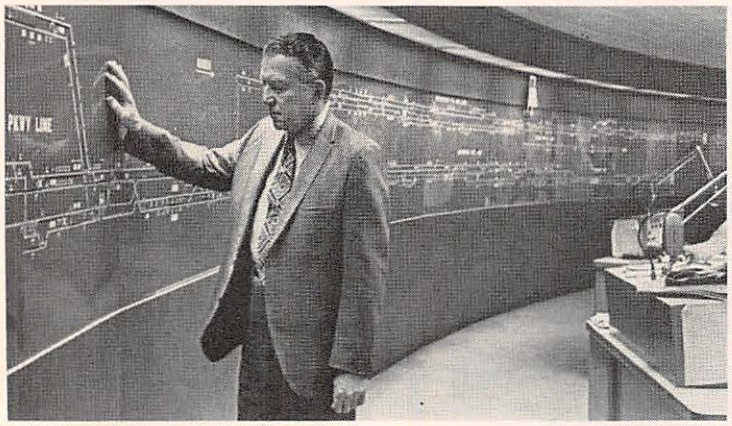
IBM Corp.

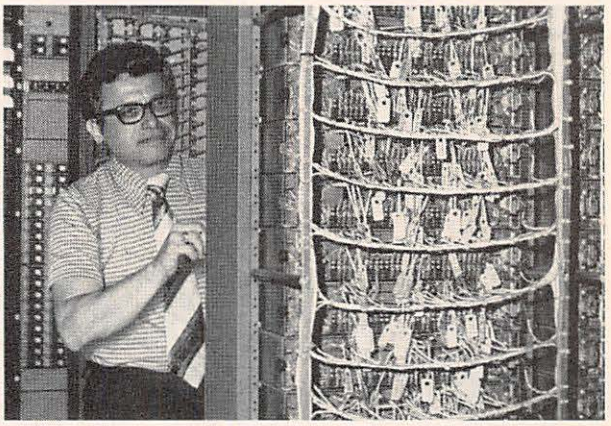
Motorola Inc.

Farinon Electric









AS YOUR SIGNAL AND CONTROL SYSTEMS GET MORE COMPLEX, THE CHOICE OF WIRE INSULATION GETS SIMPLER.

It's no news that signal, control and communications equipment in railroad and transit systems is becoming increasingly complicated. And that failure in any part of that equipment has become an increasingly serious problem.

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The photographs above show some of the uses of TEFLON in modernized switching towers and communications systems of the New York City subway system. We would like to send you a report on these applications, and test data on TEFLON and TEFZEL as insulations in the complex electrical/electronic equipment of today's railroads and transit systems. Write Du Pont Company, Room 24106, Wilmington, DE 19898.

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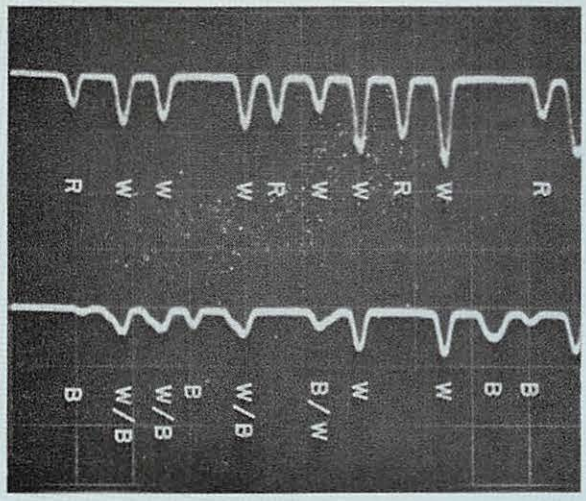

Fig. 1(a). Scanner output with manufacturer's specified settings.

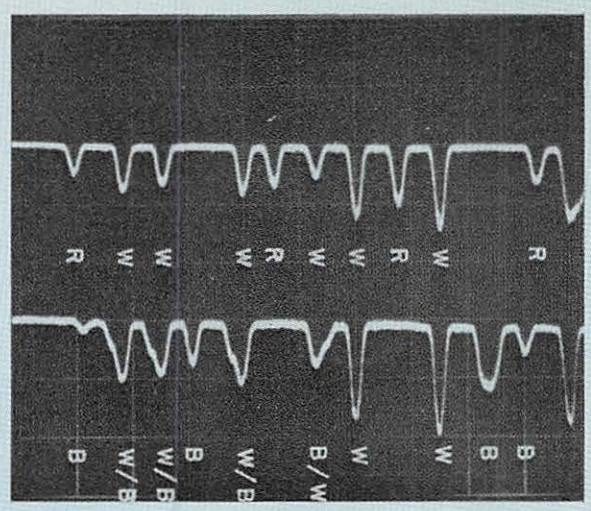

Fig. 1(b). Scanner output with blue channel arbitrarily doubled.

Fig. 1. Dirt attenuates blue light more than red light. Automatic compensation should be built into the scanner to

ACI research is undertaken

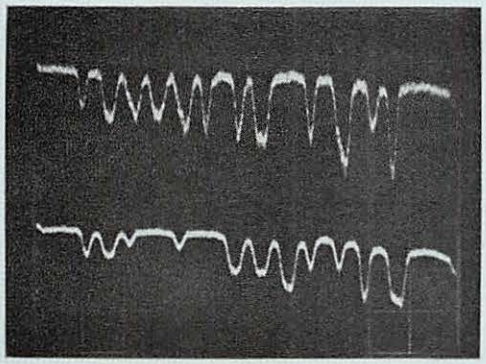

Fig. 2. Labels on flat cars had the same general characteristics as labels removed and tested in the lab. The only difference was a slope to the base line indicating a bias and distortion to the signals. Both variances were believed to be due to a 350 ft. cable between the scanner and standardizer.

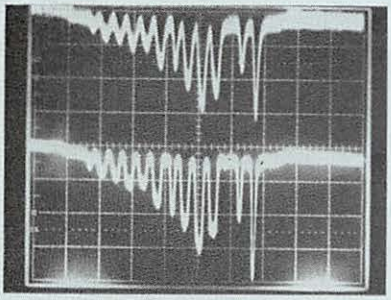

Fig. 3. A compensating circuit should be provided to correct for distortion created by various lengths of cable between the scanner and standardizer.

During the last day of the recent Data Systems convention, Charles A. Crouch, Superintendent of Communications-System, Santa Fe, presented a report about a series of tests that were conducted on a test ACI installation at Santa Fe's Argentine, Kans., yard. The tests, made under controlled conditions, were undertaken at the request of Dr. W. J. Harris, Jr., Vice President, Research, AAR, and all data has been turned over to him for further evaluation. Crouch was chairman of the AAR's ACI Hardware Committee from December 1969 to January 1973, at which time the committee had completed its assignments and was disbanded. The subject of ACI hardware was then transferred to Committee F of which Crouch is a member. The report presented by Crouch follows.

During the last couple of years, as time has permitted, I have worked on ways and means of optimizing the adjustments of the automatic car identification scanner and standardizer to give maximum percent reads without making basic changes in the equipment. While I have been able to show a small improvement in our reads, I ran into inherent equipment limitations which put a definite ceiling on the results that can be obtained.

All personal experience and data presented in this report is based on Sylvania or Servo equipment.

The present front end of the ACI equipment, which is made up of a

```
ACI 5AYE026 229 1706
00456 W ISD TOPEKA
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
0000 00000000
   E
```

Fig. 1(c). Teletype readout with manufacturer's specified settings.

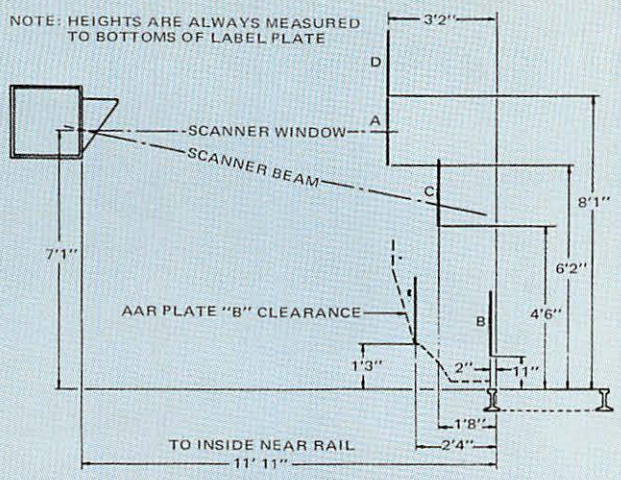

Fig. 1(d). Standard positions of labels as designated by the manufacturer.

```
ACI 5AYE031 229 1922
00456 W ISD TOPEKA
0050 368389-2 5050 3683897 2
0050 368389-2
0050 368389-2 5050 3683897 2
0050 368389-2
0050 368389-2
0050 368389-2
0050 368389-2
0050 368389-2
0050 368389-2
0050 368389-2
0050 368389-2
   E
```

Fig. 1(e). Teletype readout with blue channel arbitrarily doubled.

correct for differences in light signals.

at Santa Fe

scanner and standardizer, was designed in 1967, and I can assure you that the design was both ingenious and consistent with the technology available at that time.

As I have worked with the equipment and analyzed the various factors that limit the sensitivity of the hardware, I have come to appreciate the engineering balance that was achieved by the original designers. What I mean by engineering balance is that there is no one controlling circuit or individual part of the hardware that, if improved, will cause an appreciable increase in percent reads.

What I will endeavor to do in this report is to point out the various factors that collectively control the sensitivity of the equipment and suggest corrective actions that should be taken.

There has been a tremendous advancement in the technology of both electronics and optics since 1967, and a second generation of equipment should be made available to the railroads. Note: The author refers to second generation equipment as being updated equipment of the basic system now in use on the American railroads.

Dirty labels

In order to get the test started, arrangements were made with our Mechanical Department to remove ten dirty labels from flat cars that were reported as not reading when the cars passed an ACI scanner coming into the Argentine yards. Several of the labels provided were damaged as they were removed from the cars but we were able to select a sufficient number of what I would call characteristic dirty labels to complete our tests.

The first of a series of tests were made to study the differences in attenuation to the red, white and blue reflected light caused by dirt on the label. On the label used, the red and white modules were clearly visible but it was hard to distinguish between the blue and black modules.

Referring to Fig. 1, note that the caption states what the data from the test indicates and what corrective action should be taken. That is, dirt attenuates blue light more than red and automatic compensation should be built into the scanner to correct for differences in light signals.

The signal trace recorded in fig. 1(a) was made by taking a Polaroid photograph of an oscilloscope trace of the red and blue signals generated by the scanner as it scanned the dirty label in the "E" position. The drawing illustrated in fig. 1(d) shows the standard positions of labels as designated by the manufacturer. Position "A" is straight in front of the scanner, Position "D" is above "A", and Position "E" is located in approximately the same position as a label mounted on a flat car.

Again referring to the oscilloscope signal trace recorded in fig. 1(a), note that the upper horizontal trace is made up of signals from red and white modules, and the lower trace is made up of the signals from the blue and white modules. Also note that the blue module start pulse, which is at the left end of the lower trace, is indicated by a very small displacement of the line while the displacement caused by the red module start signal at the left end of the top line is considerably larger. In fact, all pulses on the red channel are greater than pulses on the blue channel. As a matter of information, standard red and blue modules were used at the beginning of the test to set the amplification of both channels at the same value.

In the sample readout of fig. 1(c), note the readout obtained after 100 scans of the dirty label. The readout is all zeros. The signal illustrated in fig. 1(b) shows the same pulse pattern and amplification on the red channel as shown in the signal trace recorded in fig. 1(a) but the blue channel amplifier gain was a little more than doubled. Under this condition the readout indicates ten correct reads out of twelve. The two misreads change the first zero to a five which threw the readout to the container position.

Another interesting fact that can be noted on the oscilloscope pictures in Fig. 1 is the difference in amplitude of the pulses from the blue modules and those generated by the white modules. As you probably know, white contains all colors and the pulse appearing in the blue channel generated by the white module is undoubtedly caused as much by green reflected light as the blue re-

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flected light. Further remarks will be made later about the relative loss to blue and green caused by dirt.

Test validity

A question was raised regarding the validity of tests conducted under controlled conditions in a laboratory setup and it was decided to check at least one label mounted on a flat car under actual field conditions in order to give creditibility to the laboratory tests.

The right-hand picture of Fig. 2 is a photograph of the label on the flat car. The left-hand photograph was taken at the input of the standardizer in the equipment house. Note that the red and blue channels in Fig. 2 follow the same general pattern as shown in Fig. 1. The reflected light from the blue channel was less than the reflected light in the red channel. The base line in both of the red and blue channel traces tended to follow the amplitude of the pulses. In other words, the small pulses on the left end of the traces almost returned to the original base line while the higher amplitude pulses on the right end of the traces indicate an appreciable biased voltage between the base line and the bottom of the excursion. Any change in the DC bias of the pulsating signal will limit the sensitivity to which the threshold adjustments can be made in the standardizer.

Fig. 3 gives the results of an elementary test conducted back in the radio shop to try to further explain the slope of the base line. It was found that an adjustable compensating circuit should be provided to correct for distortion and bias created by various lengths of cable used between the scanner and the standardizer or to mount the standardizer with the scanner.

The bottom trace of Fig. 3 shows the pulses received in the blue channel from a dirty label mounted in the shop. The shop installation only required a short cable between the scanner and standardizer. However, a resistance-capacitance network was used to provide filtering. This filtering network may have caused the small deviation found between the bottom of the pulses and the base line on the lower trace.

To duplicate the 350 feet of cable between the scanner and the standardizer in the field test, Fig. 2, a .005 mf capacitor was connected across the blue channel of the standardizer. While this level of capacitance is about the same as the capacitance of 350 feet of coaxial cable, it is recognized that a lumped capacitance will only approximate the effect of a similar amount of distributed capacitance between the center conductor and the shield of the coaxial cable. In comparing the top and bottom traces of Fig. 3, note a change in shape of pulses due to the .005 mf capacitor. Because of time limitations, we were unable to make further or more conclusive tests of the effect of entrance cable on the signal. The results as indicated however, did enable us to make the following conclusion: An adjustable compensating circuit should be provided to correct for distortion and bias created by various lengths of cable used between the scanner and the standardizer, or the standardizer should be located on the same mounting as the scanner.

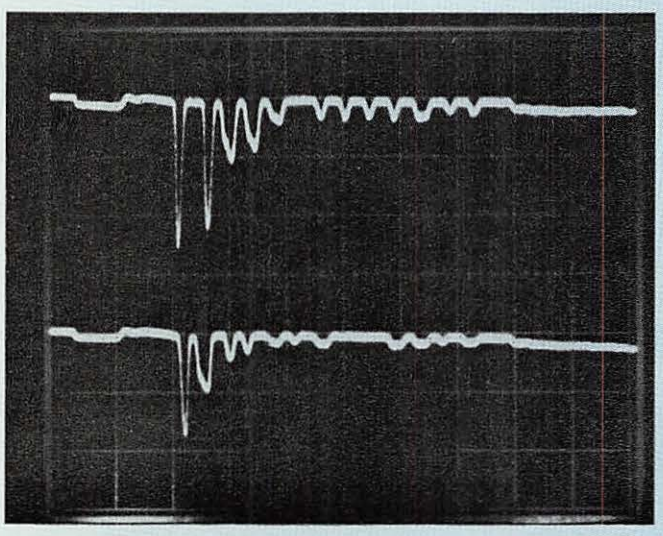


Fig. 4. The collection of dirt on a flat car label is more or less inversely proportionate to the square of the distance from the ballast to a module. This signal was generated by a label which was originally installed upside down.

Dirt variation

Quite a bit has been said about the variation of dirt collected on labels which are mounted on flat cars. A visual inspection of the labels found on a number of flat cars will indicate that the collection of dirt is much greater on the bottom of the label than at the top.

In order to make a recording of this effect, we made the tests as outlined in Fig. 4. The caption on Fig. 4 says: The collection of dirt on a flat car label is more or less inversely proportionate to the square of the distance from the ballast to a module. New labels should be placed as high on the flat car as practical and automatic compensation should be built into the scanner to correct for this type of variation in signal level.

The label we picked as a good example of the effect of the distribution of dirt happened to be one that was removed from a flat car because it was originally installed upside down. The pulses at the left side of Fig. 4 are much greater in amplitude than those at the right side of the trace. The pulses at the left side of the trace are those generated by the top part of the label and the pulses at the right side are those generated by the bottom part of the label. Note that the pulses vary as an exponential curve rather than on a straight line basis. One can also see that a minimum raise in the label installation will result in an appreciable reduction of dirt on the lower portion of the label. This will also permit the label to travel more miles between washes.

Noise

As a result of the tests it was determined that the noise level at the input of the standardizer would limit the practical amount of gain which could be provided to improve the sensitivity of the equipment. The scanner should be modified or redesigned to reduce its inherent internal noise level. To separate between the level of noise inherent in the scanner and the noise reflected from the label, the scanner face was covered with a black panel to eliminate all external light. Under this condition and, of course, with a greater sensitivity setting on the oscilloscope, the signal illustrated on the left side of Fig. 5 was generated. Note the noise level of the red channel is somewhat more than in the blue channel but both levels are more or less constant. We then placed a dirty label in position "C", leaving all the adjustments on the scanner and oscilloscope the same and photographed the signal on the right of Fig. 5.

A comparison of these pictures indicates that the noise level is the same. In other words, the internal noise generated in the scanner is of a sufficient level to overshadow light noise being re-

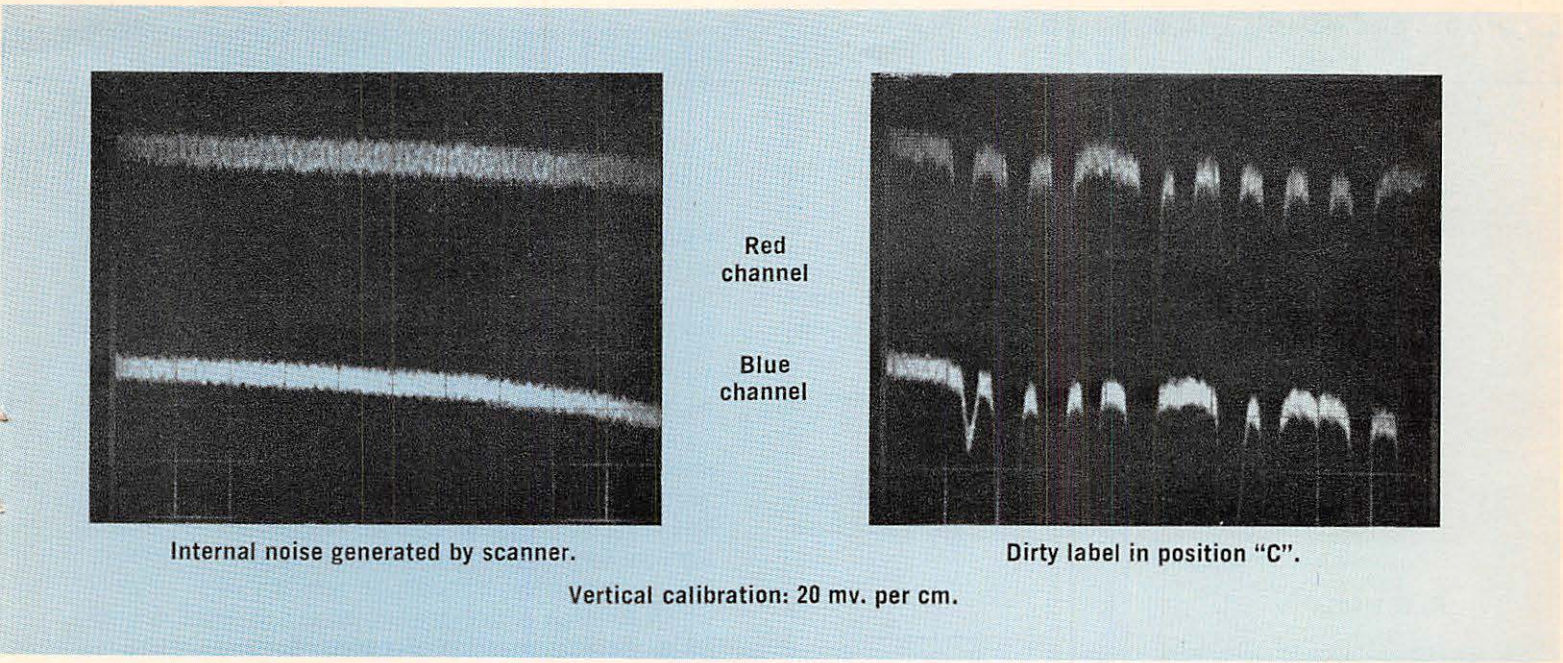

Red channel
Blue channel
Internal noise generated by scanner.
Dirty label in position "C".
Vertical calibration: 20 mv. per cm.

Fig. 5. The scanner should be modified or redesigned to reduce its inherent internal noise.

flected from the surface of the label. Also note that the blue start pulse on the left side of the bottom trace is not much greater than the noise level. This indicates that no matter how much amplification we build into the blue channel, the signal-to-noise ratio will be the controlling factor for labels with only slightly more dirt than the dirty label used in this test.

Green dye

It was suggested to add green dye to the blue dye in the label modules to determine the difference in attenuation caused by dirt. A test was undertaken to obtain the data needed to run a color loss curve on the optics of the scanner. In order to do this we made up a special label including the colors indicated in Fig. 6. The signal illustrated in Fig. 6 shows the various color pulses as they appeared in the red and blue channels. While there is a great deal of information available in Fig. 6, it should be pointed out that the amplitude of the various pulses was controlled by the reflectivity of the module material as well as by the characteristics of the optic filters. We were not able to measure the magnitude of the input signal to the optical filters and this should be taken into consideration when studying the oscilloscope photograph. The test as conducted does prove that green light will pass through the blue optical system and will not appear in the red channel. It is my opinion that green dye should be added to the blue modules to take advantage of the fact that dirt will not attenuate green light as much as blue light.

Many more tests were actually conducted at Kansas City but the ones which I have presented here should tell the story and serve as a good basis for my conclusion. "A new generation of optical scanning equipment should be provided by the manufacturers which will read labels two or three times as dirty as they can now read. Providing this equipment will improve the reliability of the system and make it possible to set up minimum label maintenance programs. I must point out however, there is no panacea and the success of any type of ACI system will depend, in the long run, on the quality of maintenance provided for the labels." Note: The author refers to second generation of optical scanning equipment as being defined as updated equipment of the basic system now in use on the American railroads.

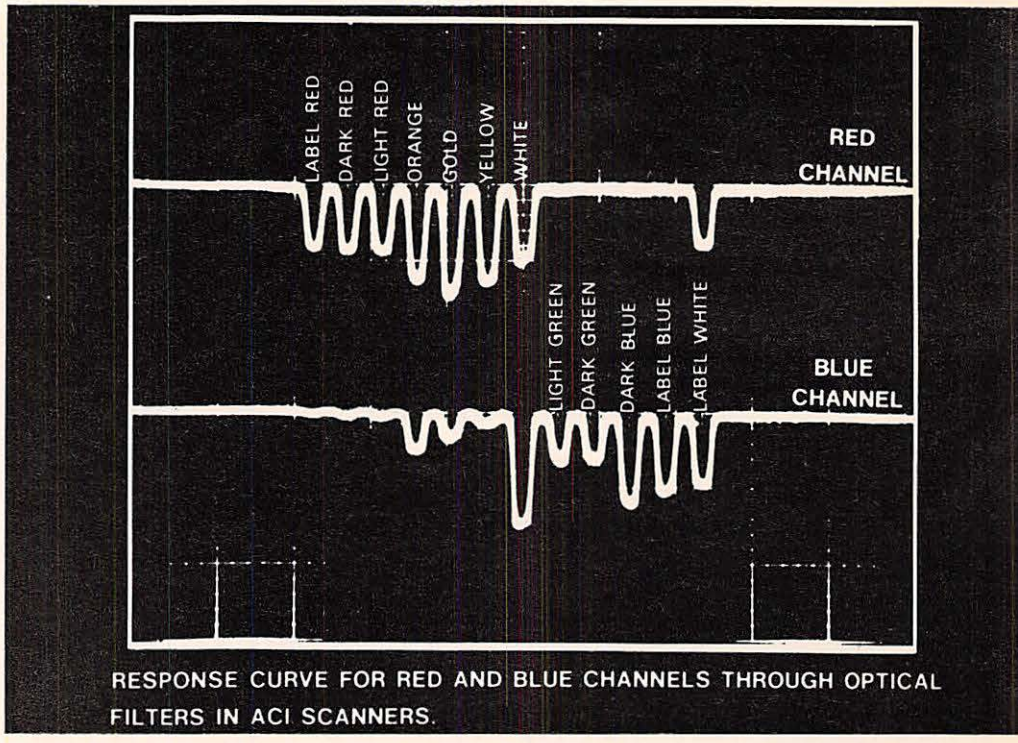


Fig. 6. Green dye should be added to the blue modules to take advantage of the fact that dirt will not attenuate green light as much as it does blue.

1. Title: RECTIFIERS

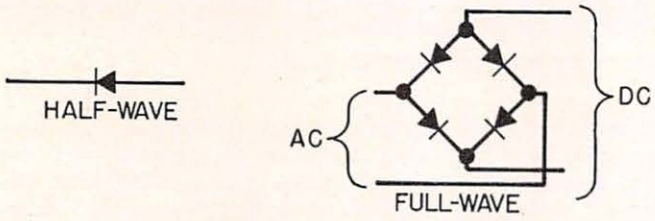
2. Definitions:

(a) Rectifier: A device which converts alternating current into unidirectional current by virtue of a characteristic permitting appreciable flow of current in one direction only.

(b) Half-Wave Rectification: Rectification permitting only one-half of the alternating current cycle to be transmitted as unidirectional current.

(c) Full-Wave Rectification: Rectification in which both halves of the alternating current cycle are transmitted as unidirectional current.

3. Symbol:



4. Description:

The basic component of the rectifier is a diode. They are produced in several forms: e.g., semi-conductor, metallic, vacuum tube, and mercury tube diode.

A diode consists of two major parts, namely the anode and cathode. The current enters the device at the anode and leaves at the cathode.

5. Purpose and Application:

Purpose of the rectifier is to convert readily available ac to unidirectional power for charging batteries, operating dc relays and other dc devices.

6. General Information:

Many railroads have instructions outlining installation, maintenance and inspection procedures with regard to rectifiers. It is most important that maintenance personnel become familiar with their company's instructions.

7. Detailed Operation:

Semi-Conductor Doides: A semi-conductor diode is constructed of two dissimilarly treated sections of the same semi-conductor material which will allow current to flow in only one direction across the junction of the two sections.

The semi-conductor diode, unlike the vacuum tube diode, does not require any heating to function. It is always ready to function without any warm-up time.

The fact that semi-conductor diodes come in various sizes allows their use in circuits having current flows of from a few milliamperes to several hundred amperes.

Metallic Diodes: A metallic diode is constructed of two different materials which will allow the effective flow of current in only one direction.

Vacuum Tube Diodes: A vacuum tube diode possesses an anode and cathode contained in a vacuum and rectifies alternating current by attracting emitted electrons from its cathode to its anode.

The cathode is constructed of a material which, when heated, will emit electrons that are needed to permit current to flow when voltage of proper polarity is applied to the diode. The cathode may be self-heated, in which case, it is constructed of one or more loops of fine wire. This type of cathode is quite similar to the filament used in lamps, and is referred to as a filament. The indirectly heated cathode consists of a cylinder which contains a heating filament that is inactive insofar as electron emission is concerned.

A typical half-wave circuit using a vacuum tube diode is shown in Fig. 1.

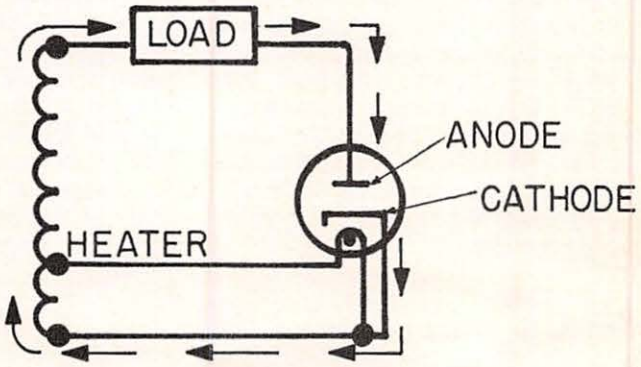


Fig. 1

When the polarity of the ac to be rectified is as shown, and the heater is hot, the tube will conduct. When the polarity is opposite to that shown, the cathode cannot emit electrons and the tube will not conduct. If the heater has failed, the tube will not conduct, regardless of the ac polarity.

The diodes can be arranged in the rectifier circuit in several configurations depending on the type of ac supplied (single—or three-phase), and the degree of rectification desired (half or full-wave).

A typical circuit for half-wave rectification is shown in Fig. 2.

This type of circuit, unfiltered, has the characteristic of supplying a dc voltage less than the impressed ac voltage. The reason for the lesser value is that only half of the ac wave is being used. The other half is blocked by the diode (See Fig. 3).

The half-wave rectification circuit, because of its low efficiency, is used in non-critical applications requiring low currents.

Typical circuits for full-wave rectification are shown in Fig. 4.

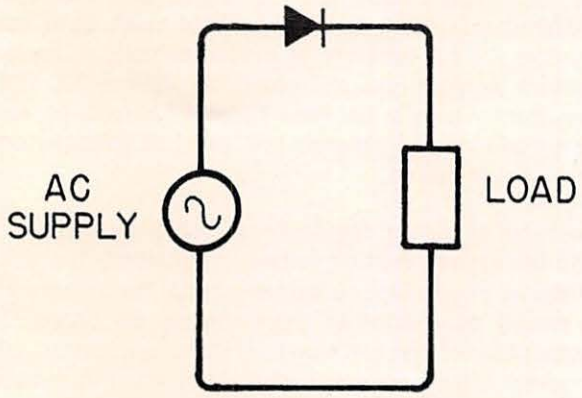


Fig. 2

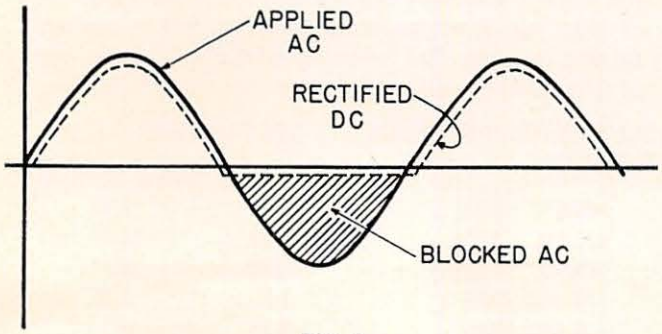


Fig. 3

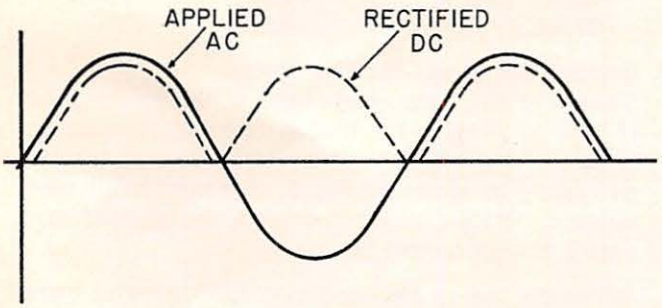


Fig. 5

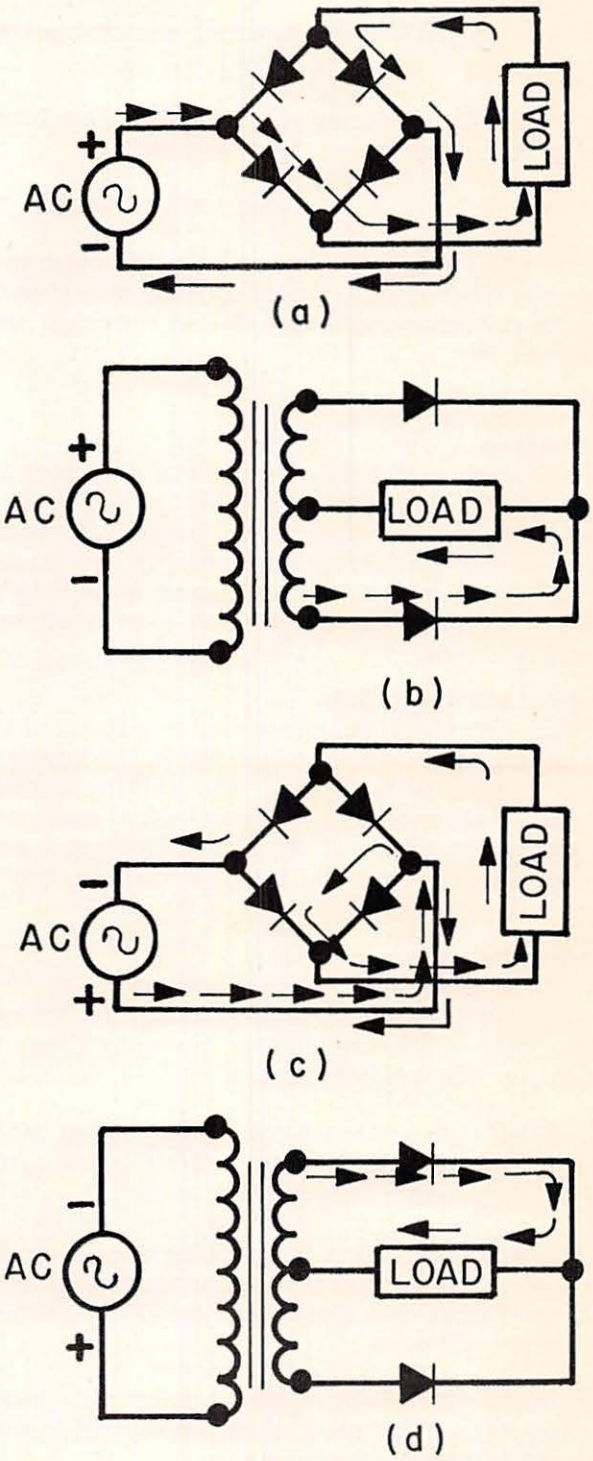


Fig. 4

Full-wave rectification can be achieved utilizing either of two configurations. When designed properly, their outputs will be almost identical. The voltage across a resistive load will be twice that of a half-wave circuit. Also, if a diode were to fail open in the full-wave circuit, a half-wave output would result.

When the AC polarities are as indicated on Figs. 4(a) and 4(b) one pair of diodes on 4(a) and diode on 4(b) will allow current flow in the path indicated. Conversely, during the other ac half cycle, when the polarities are opposite, the other diode (s) in each figure will conduct as shown in Figs. 4(c) and 4(d). During either half cycle, the rectified current flows in the same direction through the load. The input and output wave forms will be as shown in Fig. 5.

The full-wave rectifier circuit may be used in any rectification circuit. It is commonly used in battery charging circuits.

1. Title: CHARGING NICKEL-IRON AND NICKEL-CADMIUM BATTERY

2. Definition:

(a) Charging: The process of putting electrical energy into a battery.

(b) Storage Cell: A secondary cell for storing electrical energy at one time for use at another time.

(c) Battery: A group of cells, electrically connected.

(d) Rectifier: A device which converts alternating current into unidirectional current by virtue of a characteristic permitting appreciable flow of current in one direction only.

3. Symbol: None

4. Description:

As the definition implies, a storage cell is charged by applying dc to its terminals. The direct current must be passed through the cell in the opposite direction to that in which the current flows when the cell is discharging. The source of direct current is normally a rectifier which receives its power from an ac source and converts it to dc.

5. Purpose and Application:

Storage battery with rectifier is used as a source of dc power at locations where ac is available. It is used for track circuits, signal lighting, relay circuits, highway crossing protection or for any railway signal equipment or circuit that requires direct current. Charging is simply a means of keeping the battery in operating condition.

6. General Information:

(a) **Initial Charge**—All batteries lose some of their charge during shipment or when standing idle. The battery should be given an initial or freshening charge to make sure that it is fully charged.

Nickel-cadmium and nickel-iron batteries should be initially charged at higher than normal rate until the voltage of the lowest cell has become constant.

At the end of the initial or freshening charge, specific gravity, voltage, temperature, charging rate and electrolyte level of all cells should be checked and recorded for future reference.

(b) **Trickle Charge**—In signal applications, trickle charge refers to the charging current required to compensate for internal losses only.

A trickle charge is used to keep spare batteries fully charged and ready for immediate use.

(c) **Floating Charge**—The floating charge must supply sufficient current to operate the signal system components and also supply sufficient current to the battery to maintain terminal voltage. In floating service, charging rates should initially be set higher than necessary and gradually reduced from week to week until consecutive voltage readings of individual cells at normal solution temperatures of from 15.5C (60F) to 21C (70F) consistently remain between 1.5 and 1.6 volts per cell for nickel-iron and between 1.42 and 1.50 volts per cell for nickel-cadmium.

The rectifier output should be adjusted, as necessary, until the correct floating voltage is obtained. The state of charge of an alkaline battery cannot be determined as readily as with other types. During discharge, the composition of the electrolyte remains unchanged and it merely acts as an agent for the oxygen. The specific gravity does not change appreciably during discharge or recharge, and a specific gravity reading, therefore, has no significance. The only practical means is to read the voltage of a pilot cell under a momentary high rate of discharge. A device known as a test fork is available for this purpose. The following tables indicate voltages of fully charged cells at solution temperatures shown:

SOLUTION TEMPERATURE	VOLTAGE PER CELL	
	Nickel-Iron	Nickel-Cadmium
26.67C (80F)	1.48	1.45
21.11C (70F)	1.50	1.47
15.55C (60F)	1.52	1.49
10.00C (50F)	1.55	1.51
4.44C (40F)	1.58	1.53
−1.11C (30F)	1.60	1.55
−6.67C (20F)	1.61	1.57
−12.22C (10F)	1.62	1.59
−17.78C (0F)	1.63	1.61

7. Detailed Operation—Floating Charge:

Since it is the most widely used of the various types of battery charging, the float system will be described in detail. All battery charging systems are not connected exactly as shown in Fig. 1. However, in all cases where a "floating system" is used, the rectifier must supply enough current to:

(a) Supply the steady connected load (relay or signal load).

(b) Return to the battery the amount taken out during intermittent discharge from the battery.

(c) Make up for local action or internal loss in the battery.

The rectifier current is used to operate the circuit under normal conditions and to maintain the charge of the battery at the same time. Under heavy load conditions such as a train shunting a track circuit, or a switch machine operating, the battery will be called upon to deliver the extra current required for the operation of these circuits or devices. In the event of an ac power interruption, the battery will carry the complete load until the power is restored.

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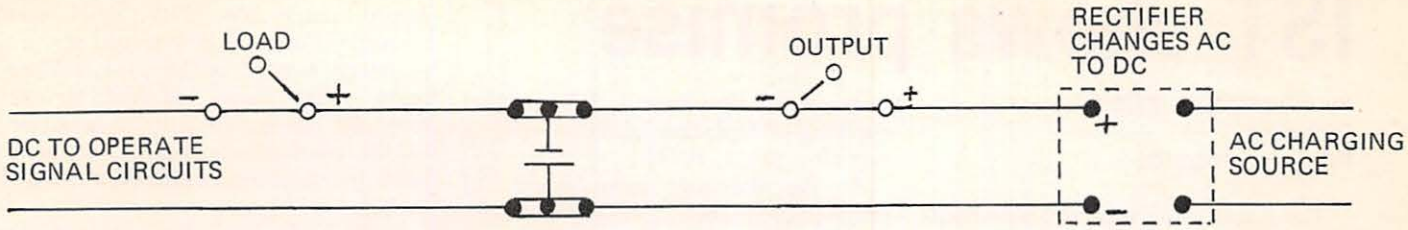

Fig. 1

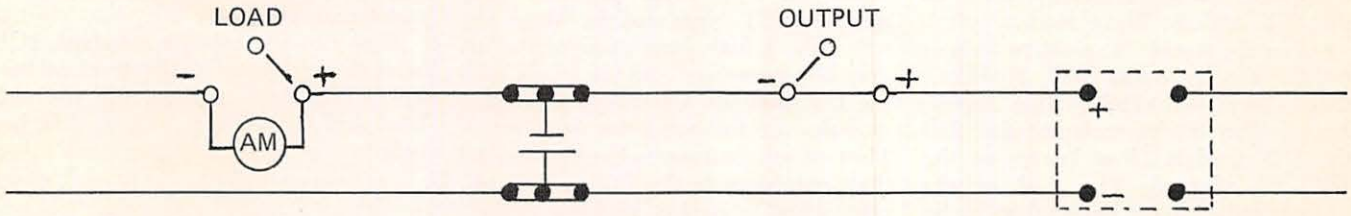

Fig. 2—Test to determine amount of current being supplied to operate the circuit load. Note: Open test link to obtain current reading.

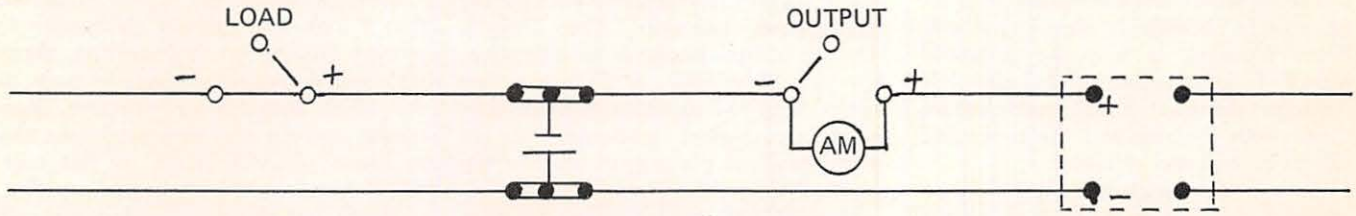

Fig. 3—Test to determine total rectifier output. This is the sum of the currents which supply the load and charge the battery. Note: Open test link to obtain current reading.

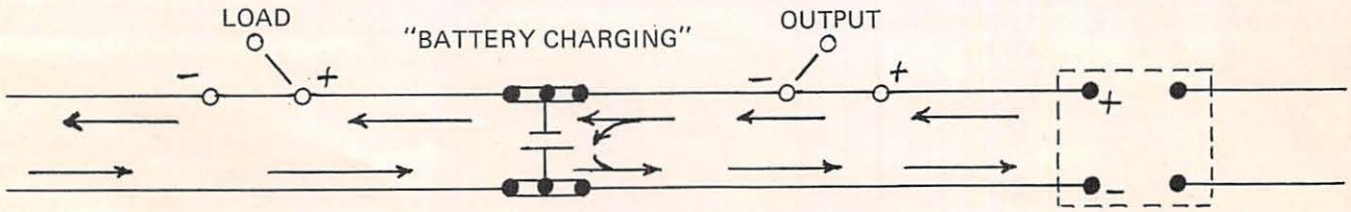

Fig. 4—Conditions normal. Battery receiving charge and circuit drawing a normal current load.

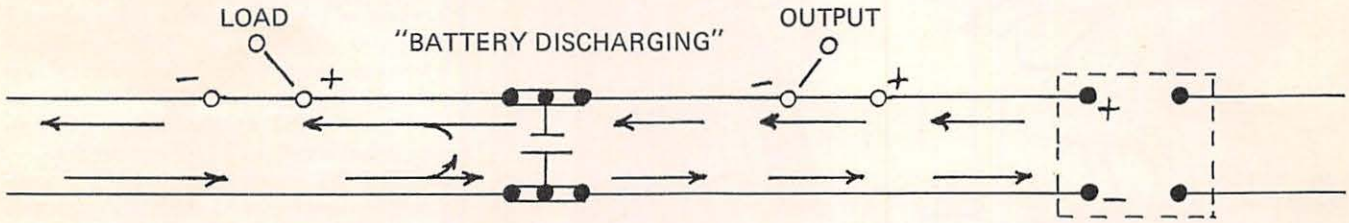

Fig. 5—Circuit under heavy load. Current flows from rectifier and also from battery.

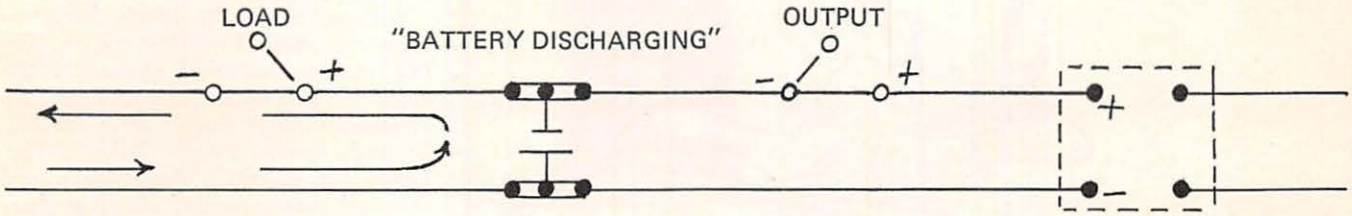

Fig. 6—AC power interruption. Current flows from battery to operate circuit. No current flows from rectifier until charging power is restored.

Figs. 2 and 3 illustrate where the ammeter is inserted to determine the current output of the rectifier.

Figs. 4, 5 and 6 illustrate the current paths for three different operating conditions.

IST shows promise

By NORMAN R. BUCK
President
INFO, Incorporated

The Label Improvement Subcommittee of the AAR ACI Ad Hoc Committee conducted an evaluation of a fluorocarbon coated module originally known as the SST module. These studies culminated in the report, "Evaluation of Special Surface Treatment (SST) Modules", dated Nov. 15, 1973. This report, among other things, recommended that the SST module (now known as the IST) be adopted. The goal of the recommendation was easier cleaning by eliminating special cleaning agents. In addition, the labels stay cleaner between washings.

The labels are less susceptible to damage due to abrasion or chemical attack. Since cleaning is a major potential source of surface abrasion and chemical damage, the use of IST modules reduces both the risk and the unwanted effects of improper cleaning.

As you are aware, the AAR has instructed the member roads to switch from the standard ACI to the IST type module. This change is effective on new cars ordered after June 1, 1974 and on applying or replacing labels on existing cars after Jan. 1, 1974.

As the dominate manufacturer of preassembled labels, INFO is in a position to monitor the trend in new car applications. Approximately half the preassembled labels are currently made with the IST type module. More significantly, a high percentage of the orders being received call for labels with the IST modules. Orders for individual modules are following the same trend. Most of our customers have converted their purchases to the IST module except where standard modules are required to balance out existing stocks.

Since the original studies were conducted, there has been little effort to follow up on these original tests by the participating railroads. The Duluth, Missabe & Iron Range is an exception. Approximately 50% of their cars are labeled with IST modules. Because they maintain control of these cars, they are in an excellent position to observe the merits of the new module.

The DM&IR scans its cars as they pass over the weigh scales. Prior to scanning, the labels are washed with clear water under moderate pressure. Approximately 95% of the labels scan correctly. Cars that do not read are subsequently located in the yard and corrected. They have observed no cars with IST labels that failed to read due to dirt, while a large majority of the no reads for standard labels was attributed to dirt.

I think these results bear out the original hopes for the IST module to increase readability and greatly reduce maintenance efforts.

How can the existing standard ACI label be upgraded to the level of the IST label, short of removing the old label and replacing it with an IST label?

We know for a fact, you've got DIRTY, FILTHY labels on your cars!

IST overlay

Several months ago, it was suggested that I look into making an overlay to protect existing labels from dirt, abrasion and deterioration due, in part, to the label maintenance program. Particular concern was expressed over the problems of ACI labels on flat cars. Since then, events have moved rapidly.

INFO has developed what we call an IST overlay, which will effectively transform an existing standard label into one possessing the characteristics of an IST label; namely easy cleaning, resistance to abrasion and protection against chemicals and deterioration of the colors. The procedure consists of thoroughly cleaning the existing label, drying it and applying the IST overlay with a suitable application tool. INFO has successfully used an orbital sander with a special rubber shoe attached. Our experience indicates that once a label has been cleaned and dried, application of the IST overlay takes about 2 minutes. Allowing for field conditions, average installation time for a car should be no more than 10 minutes. Cost of the IST overlay is currently projected at less than $3.00 per car set.

The IST overlay consists of a fluorocarbon sheet coated with an extremely stable high tack adhesive. It is mounted on a release liner and is premasked to aid in application.

Let's talk about the design characteristics and some of our test results. The IST overlay embodies essentially the same qualities as our IST modules. Its surface is a .002 fluorocarbon film. In layman's terms, this is Teflon®. The Teflon film embodies the abrasion and chemical resistance, and cleaning characteristics denoted in the name IST—Improved Surface Treatment. The bonding agents employed in our IST overlay were selected for extreme stability over time. They are a product of the latest technology.

In developing our IST and the IST overlay, we were able to achieve the following characteristics:

Resistance to weathering and ultra violet light—Tests to date on our IST module indicate no deterioration in photometric response or physical appearance due to weathering or ultra violet light. In short, we have not yet found the point at which our IST module begins to age. We believe these results also apply to the overlay and we are conducting aging tests now.

Clarity. The IST overlay is optically clear. Our tests indicate that there is essentially no change in photometric readings due to application of the overlay.

Hot and cold temperatures. Our IST overlay has successfully withstood extremes from being packed in dry ice (−105°F.) to baking at 350°F. under simulated thawing shed conditions.

Application of the overlay to our existing label raises some questions which we have tried to answer by testing. During application, a small bubble of air is trapped around the edge of each module. To determine its effect, we then ran hot and cold cycling tests (180°F. to −5°F.) culminating in dropping the cold plate into boiling water. While the bubbles expanded slightly, they did not expand onto the module face and the modules continued to be completely sealed by the overlay.

The above tests were performed on a module that had been severely gouged and with the Teflon film broken in numerous places. The damage did not spread. In all of the above tests, the photometric readings were not affected We have been assured by Servo Corp. that these bubbles will not affect the scanning of a label.

Next we simulated incomplete drying of a label prior to application of the overlay. Water was trapped around the edges and on top of several modules. The plate was then hot and cold cycled as above. The bubbles around the edges of the module expanded somewhat more. The water drops on top of the modules remained confined to relatively small areas and the overlay continued to seal the plate.

The IST overlay is designed to be removable in case of misapplication or traumatic damage. It can be peeled off the label cleanly. However, our tests indicate the bonding level is such that the overlay remained intact and the edges securely in place despite vigorous brushing with a stiff bristle scrub brush. The field application temperature of the overlay appears to be limited only by the temperatures that will allow proper preparation of the labels.

(Continued on page 27)

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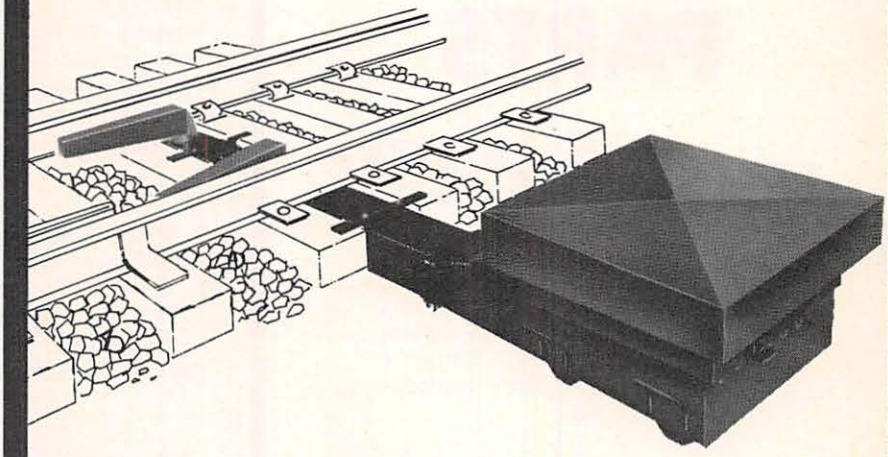

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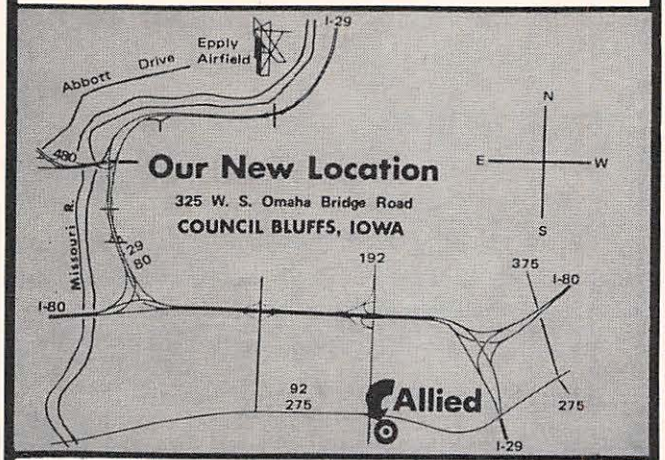

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50 YEARS AGO IN

Railway Signaling

Vol. 17 OCTOBER, 1924 No. 10

The Signal section of the American Railway Association held its annual stated meeting at the New Ocean House, Swampscott, Mass., on September 23, 24 and 25. Several committees, including the Committee of Direction, held meetings on Monday in advance of the convention. The program for Tuesday included the discussion of the reports on signaling and interlocking; the entire day Wednesday was devoted to the subject of train control and the unfinished business was handled Thursday forenoon. A record total attendance of 517, including 103 guests, exceeded by 50 the attendance at any previous session of the association. W. M. Vandersluis, chairman of the section, presided over the convention.

° ° °

The automatic block signals on the Northern Pacific now extend in an unbroken line from the head of the Great Lakes to the Pacific coast, the last signal blade being attached by C. A. Christofferson, signal engineer, at Little Falls, Minn., on September 15. The Northern Pacific is the first transcontinental railroad in the Northwest to be so equipped.

° ° °

The Brotherhood of Railroad Signalmen of America held its second biennial and seventeenth regular meeting at the Hotel Chase, St. Louis, Mo., September 8 to 13, inclusive.

° ° °

It is understood the American Telephone and Telegraph Company has a new polar telegraph relay. This relay is mounted vertically and is provided with plug and socket contacts similar to latest design of Wheatstone relay.

° ° °

The New York Central Railroad Company has placed an order with the General Railway Signal Company for one 96-lever Style "A" mechanical interlocking machine for installation at Calumet, Ind. This machine will have 75 working levers and 21 spare spaces.

° ° °

The Western Pacific Railroad Company has ordered 102 one-arm two-position Style "B" signals for the protection of traffic over the joint tracks of the Western Pacific and the Southern Pacific Railroads between Alazon and Wesso, Nevada, a total of 178 miles. All materials for this signaling have been furnished by the Union Switch and Signal Company, and the field installation is being handled by the signal construction forces of the Western Pacific Railroad.

° ° °

The Committee X—Education and Training of Employees, chairman P. F. Frenzer (N. P.) has made extensive inquiries of methods used on various roads for the education of employees. Inquiries show that 147 have never had any course of instruction for employees, 12 roads have had some form of instruction but have discontinued from lack of proper interest and 13 roads are at present offering courses.

IST shows promise

(continued from page 25)

Given our experience with the IST module and the overlay, we feel some tentative conclusions can be drawn.

First the overlay provides a means of upgrading standard labels to IST labels with relatively small cost and time.

The IST overlay provides a means of locking in the standard label at its current level and preventing further deterioration.

The IST overlay has the novel feature that may even make it superior to a label made with individual IST modules. Not only does it protect the module surface but also seals the module edges and the surrounding plate.

The IST overlay is completely compatible with present labels and scanners in use.

The IST overlay can be applied over existing labels with the use of a special tool. Field application is limited to the extent that a power source is required and that the operator uses reasonable care.

To further test these tentative conclusions, we will be making field applications in the very near future. And, of course, we shall continue to conduct other tests on the IST overlay.

Through this and other research projects, INFO is committed to taking an active role in the improvement of the ACI system.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

(Act of August 12, 1970; Section 3685, Title 39, United States Code)

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In accordance with the provisions of this statute, I hereby request permission to mail the publication named in Item 1 at the reduced postage rates presently authorized by 39 U. S. C. 3626.

(Signed) Robert G. Lewis
Publisher

10. Not applicable.
11. Extent and nature of circulation.

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   1. Sales through dealers and carriers, street vendors and counter sales. Average 0; Single issue nearest filing date 0.
   2. Mail subscriptions. Average is 2,221; Single issue nearest filing date is 2,132.
C. Total Paid Circulation. Average is 2,221; Single issue nearest filing date is 2,132.
D. Free Distribution By Mail, Carrier or other means.
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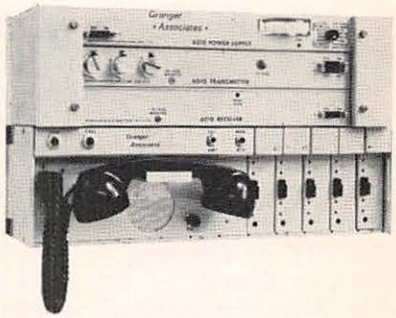

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People

CANADIAN NATIONAL.–M. Passnick, assistant regional signal inspector, appointed general supervisor signal inspection, St. Lawrence Region, Montreal, Que., succeeding **D. Ogilvie,** retired.

CHICAGO RAILROAD TERMINAL INFORMATION SYSTEM, INC.– Donald H. King, vice president, Chicago Region, **Burlington Northern,** elected president and chairman of the board and director of CRTIS. **L. A. Brophy** has been elected to full-time duties as vice president and executive director of CRTIS. **R. H. Lindsay,** assistant to the president, **Western Railroad Association,** elected secretary-treasurer of CRTIS.

METROPOLITAN ATLANTA RAPID TRANSIT AUTHORITY.–T. William Swinford, Director of Public Affairs, **Urban Mass Transportation Administration, U.S. Department of Transportation,** Washington, D.C., has been appointed to the newly created post of assistant to the general manager for communications and marketing, MARTA.

SUPPLIERS

L. L. White, Jr., has been elected a corporate vice president, **PORTEC, Inc.,** in addition to his responsibilities as head of the recently formed Transportation Products Group, which consists of the Paragon, Railway Products and Shippings Systems Divisions.

R. M. Karow, manager terminal markets, **Union Switch & Signal Division** of **WABCO,** Swissvale, Pa., has been appointed marketing manager–railroads. **C. E. Stipancic,** manager train control and signaling markets, has been appointed marketing manager-transit.

Homer L. Hathaway, senior systems consultant, engineering department, **Union Switch & Signal Division** of **WABCO,** has been appointed manager-transit market development, Swissvale, Pa.

Walpar, Inc., has acquired the Highway and Railroad Safety Products Division of **Planet Corp.,** Birmingham, Ala.

Andrew H. Nickolas, a senior engineer, design section, research & development department, **Union Switch & Signal Division** of **WABCO,** has been appointed supervising engineer, Digital System's Group, Railroad and Industrial Control Section, Swissvale, Pa.

James P. Campbell and **Carl D. Carman** have been elected vice presidents of **Data General Corp.,** Southboro, Mass. Dr. Campbell previously was corporate director of personnel activities and Mr. Carman was director of engineering.

Roy A. Nelson has been appointed director-marketing, **Okonite Co.,** Ramsey, N.J. Mr. Nelson will also continue as manager-mining marketing. Reporting to Mr. Nelson will be **James M. Daly,** manager-C-L-X marketing; **Richard A. Guba,** manager-utility marketing; **George A. Jollie,** manager-special products and **Albert R. La Paz,** manager-industrial marketing.

L. L. White, Jr.
PORTEC

R. M. Karow
US&S

C. E. Stipancic
US&S

Homer L. Hathaway
US&S

Charles A. Dean, Jr. has been appointed district manager, Okonite, Tulsa, Okla. He was formerly a power sales engineer, Public Service Co. of Oklahoma.

Okonite has appointed the following sales representatives: **John M. Herbert, Jr.,** Charlotte district; **Hugh O. Coleman, Jr.,** Los Angeles district; and **George W. Farrell,** Chicago district.

Vincent J. Loscalzo has been appointed manager-industrial sales district, St. Louis, Omaha, and Kansas City area, Industrial Sales Division, **General Electric Co.,** at St. Louis. Mr. Loscalzo has been manager-marketing, speed variator department.

William B. Dufer has been appointed senior consultant, **Union Switch & Signal Division** of **WABCO,** at Swissvale, Pa. He will be responsible for providing technical assistance and consultation on matters pertaining to transit markets, and for other duties as assigned. He will report to D. D. Huffman, vice president-engineering.

Raymond Hamblett has been appointed manager, international sales, Mobile Communications Systems, **RCA Corp.,** a newly created position at Meadow Lands, Pa.

Allan C. Sanderson has been appointed marketing manager, transportation

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Immediate openings are available in communications department of Long Island, New York transportation company for a Jr Engineer and Sr Engineer to design circuits and systems, and prepare detailed technical specifications for the following:

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- PABX
- MICROWAVE
- VOICE CARRIER
- OUTSIDE PLANT
- MOBILE RADIO
- CONTROL CIRCUITS

These positions require a BSEE; successful candidates will have the ability to handle varied assignments independently.

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division, **Westinghouse Electric Corp.** Mr. Sanderson was formerly manager of transportation products. In his new assignment, Mr. Sanderson will direct the division's marketing activities in providing propulsion equipment and automatic train controls for rapid transit vehicles and railroad commuter cars in the U.S. and abroad. He will also be responsible for vehicle system, or people mover, sales for such transit applications as airports and shopping centers.

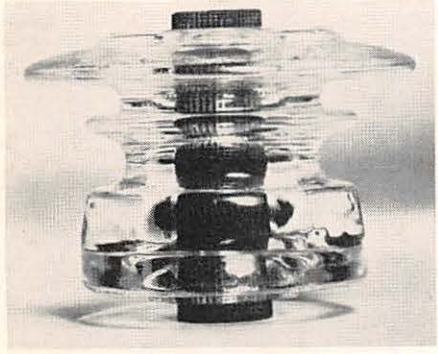
Anaconda Wire & Cable Co. has officially changed its name to **The Anaconda Co., Wire and Cable Division.**

Product News

New batteries are good for 1680 amp-hours

Globe-Union, Inc. has extended its standby power offerings from 100 to 1680 ampere-hours with the introduction of a new series Tel/Cell communications and switchgear batteries. Featured are new large power cells of lead calcium construction, designed to provide exceptionally long life with minimum maintenance. Globe-Union, Inc.

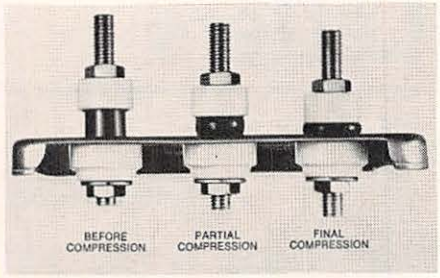
Circle 101 on reader service card



Wide range of conductors will fit new glass insulator

The 1088 Hemingray Glass Insulator has been redesigned with the conductor groove enlarged from .375 to .400 in. This permits fitting a wider range of wire conductors, with greater diameters than before. Designed especially for use on case aluminum crossarm or mid-span transposition brackets, their extreme ruggedness and light-weight are said to make the insulator suitable for carrier circuit transposition. Transandean Associates, Inc.

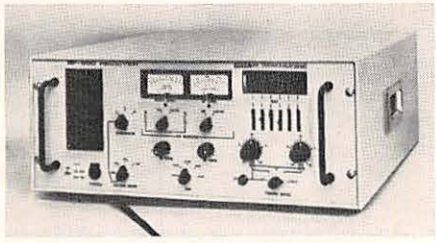
Circle 102 on reader service card



Ceramic terminal employs silicone rubber

A heavy current ceramic terminal, rated up to 60 amps, that can be installed on panels of any thickness is now available. The patented construction of the twist-free action, and the unique method of seal, employs silicone rubber as the sealing medium. When installed, the seal is compressed against the mounting panel, forming a flange type seal while exerting uniform pressure against the conductor. The terminal meets all applicable military specs. For extreme sealing or torque requirements, the inner ceramic insulator can be metallized. Sphere Co., Inc.

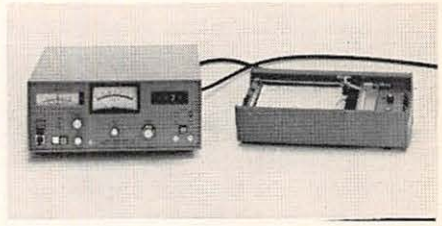
Circle 103 on reader service card



Communications receiver has 100 KHz to 30 MHz range

A new receiver that tunes the complete MF/HF frequency range from 100 KHz to 30 MHz in 100 hz increments has been introduced by Harris RF Communications. The solid-state receiver can be easily tuned by six decade switches with frequency being directly read on the six-digit electronic display. Basic receiver stability is 1 part in 10^6 per day. An optional reference oscillator is available with a stability of 1 part in 10^8 per day. The receiver can receive CW, AM, USB, LSB and two-channel ISB. Harris Corp.

Circle 104 on reader service card



Test system measures line return loss

The model 1691 fault locator is said to accurately measure telecommunications transmission line return loss and discontinuity position. The magnitude and exact location of faults caused by bent, crushed, corroded, misaligned, broken, or otherwise damaged transmission line is said to be obtained rapidly and directly. The system is used for quality assurance measurements during installation or as a preventive maintenance check on operating waveguide and coaxial systems. Return loss can be measured over a 60 dB dynamic range and with a distance display resolution of 0.1 foot over a 500-foot range. Resultant echo distortion is obtained from these measurements. Units cover the frequency ranges of 1.7 to 11.7 GHz. Scientific-Atlanta Inc.

Circle 105 on reader service card

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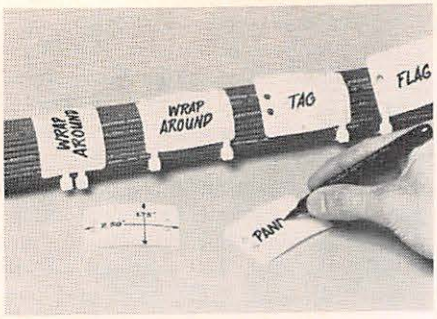
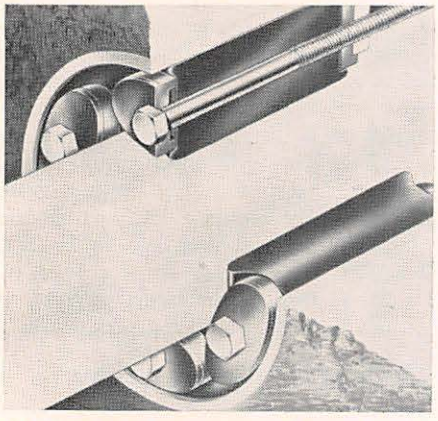


New marker plate is for wire identification

A new marker plate measuring 1¾ by 2½ inches is said to provide 60% more marking surface than previously available markers. According to the manufacturer, the MP-250W175 marker plate provides clear, permanent identification to wire bundles. Because of its larger size the marker is useful in identifying large diameter bundles as well as bundles in out-of-the-way locations.

Standard cross-section cable ties are used to secure the identification marker plates to bundles. Because of their unique design with round holes instead of slots, the markers can be mounted in any direction, either vertical, or horizontal to the wire bundle. They can be used as tags, flags, and wrap-around identification plates. Panduit Corp.

Circle 106 on reader service card

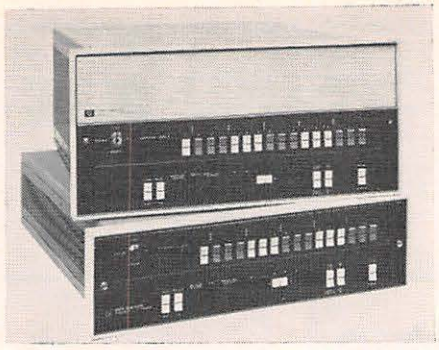


Link-seal closure is good for conduit

Thunderline Corp. has expanded its link-seal modular closure line by introducing additional models and modifications. The new models permit their use on larger size conduit and pipe than previously possible. Diameters up to 120 in. have already been sealed effectively and due to the new design, the range is almost infinite.

In addition, all models of link-seal are now available for special services such as high-temperature application lines, resistance to aromatic fuels, and for extreme corrosive environment stainless hardware is offered. *Thunderline Corp.*

Circle 107 on reader service card



New minicomputer family uses 4K RAM memory

With its adoption as the main memory in a series of new user-microprogrammable 16-bit minicomputers, the 4K RAM (Random Access Memory) has come to early maturity. The new memory system is said to make possible reductions in size, weight, power consumption and cost.

Introduced at this time are two new processors, each with a choice of two different memory systems. Both are fully microprogrammed with an internal 24-bit control processor. Model 2105A can contain within its mainframe four powered Input-Output channels. 32K 16-bit words of memory. It has Model 2108A has nine Input-Output channels and space for a 32K memory, expandable later this year to 64K. An Extended Arithmetic Unit is standard on both processors.

Hewlett-Packard user-accessible processors treat language instructions as directives to processor programs, which actually execute the instructions. The new control processor, common to both models, now has control address space for 4096 24-bit words. *Hewlett-Packard Co.* *Circle 108 on reader service card*

Letters

ACI getting better

Hicksville, N.Y.

To the Editor:

Late last fall, the O.T. General Committee of the Association of American Railroads began to address itself seriously to the matter of improved automatic car identification label maintenance. We are now happy to report that since January 1974, the decline through July, 1974 in label readability has been reversed and an average ½% per month improvement has been noted (6% per year rate). The increase is the effect of the start of an active label maintenance program by a very limited number of railroads. We believe these results are a vivid demonstration of what can be expected when all the North American roads participate.

We believe it is evident that a "total" label maintenance program, when coupled with the phased installation of the new AAR standard IST (Improved Surface Treatment) modules on all new cars, will produce even more dramatic improvements. Servo is continuing to work with the label manufacturers to improve label materials for better optical characteristics without sacrifice of label interchangeability or system compatibility.

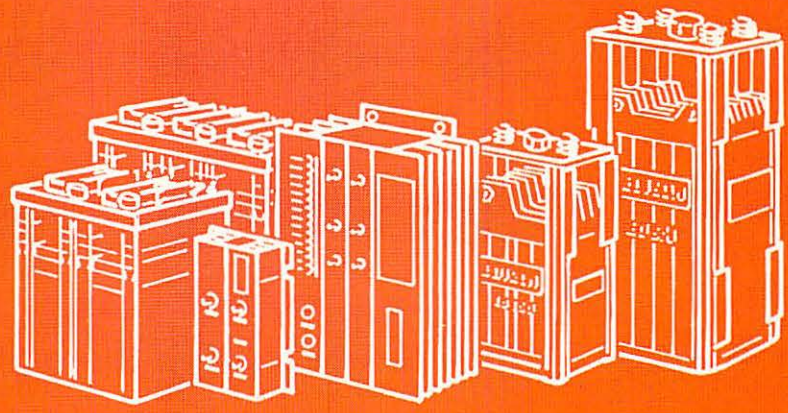
An excellent example of vigorous participation in the label maintenance program can be found on the Santa Fe. At the present time, they are washing a majority of all TOFC/COFC rolling stock at Chicago and Los Angeles, while the cars are being loaded and inspected prior to release. We have been told about controlled tests conducted on the Super C, where under an intensified label washing and repair program the reading percentages were raised from the mid 70% range to the mid 90% range. In addition, they are washing and maintaining a minimum of 400 car/labels per day across the system. As the cars with repaired and washed labels fan out in regular service the improved readability will begin to have its effect on other railroads.

Other actions by Servo and the AAR are underway to improve label readability. Analysis of low readability data leads to the conclusion that TOFC/COFC flat cars with labels mounted just above roadbeds contribute an inordinate amount of the incorrect reads due to the increasing number of cars in this category (150,000) and the multiple times (due to high mileage) that each is read in any one month. Current actions to effectively raise the label (by diminishing its size) and improving the material (IST) will assist in solving this problem.

Servo is pleased to report these label reading improvements and to be able to work with all railroads on label cleaning and maintenance problems. Please feel free to call on the services of our systems or applications engineers at any time that you feel our company can be of assistance.

Henry Blackstone
President
Servo Corp.

Completely Manufactured in the United States of America



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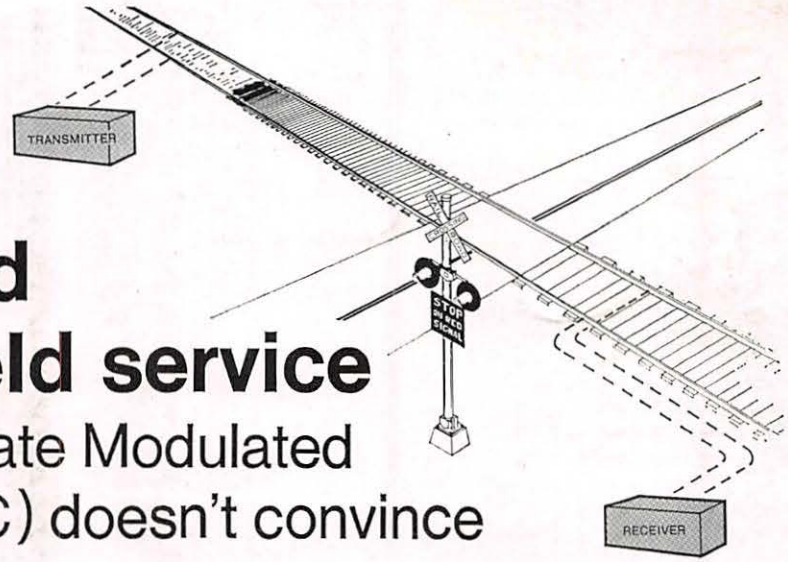

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These MTC-100 Features Assure HIGH RELIABILITY, SIMPLIFIED SERVICE

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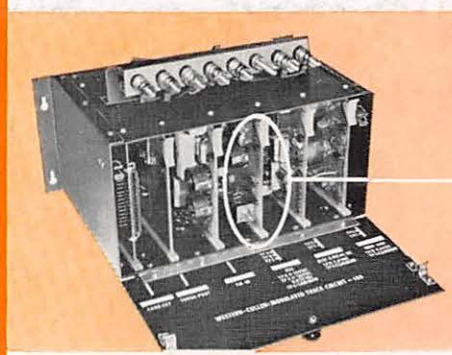
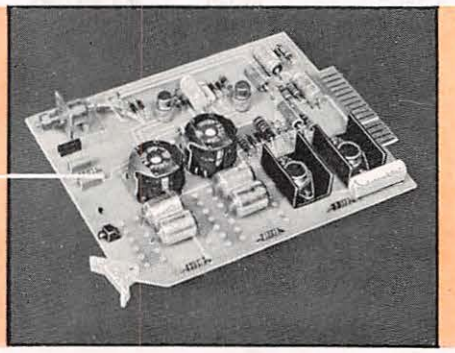


RECEIVER: 40-2000 SERIES
One card extender furnished with each receiver for servicing transmitter and receiver modules.



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All modules are equipped with LED indicators to show that the modules are functioning properly. The LED's can be used for level adjustments during installation without the need for special test equipment.

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The WC MTC-100 transmitter and receiver operates over a temperature range from −40°F to +160°F.

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Warranty on all defective parts and workmanship.*

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*2 year warranty from date of sale, 1 year warranty from date of installation.

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